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January's Authors

J. Frank Dobie, beloved Texas teacher and historian, is currently professoring at Oxford in a sort of educational ambassadorial capacity. . . . E. D. Neff is a Lieutenant in the United States Navy, a former Washington newspaperman with an avid interest in Nature and an inquiring mind. . . . Kate Harris is a free lance writer of Dayton, Ohio, who knows how to go out and get a story. . . . Homer F. Snow is a student of Nature, lecturer, writer and photographer. He lives in San Francisco. . . . Anna C. Winlow lives in Redlands, California, is a lover of Nature and the author of a number of books. . . . Joseph Y. Beaty's address is Crystal Lake, Illinois. He is actively interested in Nature, as may be gathered from the name of his farm, which is Wee Thistlebrae Farm. . . . Josephine True lives in Willard, Ohio, but is a graduate of Bowling Green State University, Indiana, where she knew Edwin Lincoln Moseley, and where she gathered the material for her article. . . . Lulu May Aler is a leader among Minneapolis bird enthusiasts and has appeared before in our pages. . . . Andrew S. Wing is secretary-manager of the National Victory Garden Institute and Garden Editor of *Nature Magazine*. . . . Howard Zahniser, our Book Editor, is in charge of public relations for the United States Bureau of Plant Industry at Beltsville, Maryland.

Golden Anniversary

Congratulations to Willard N. Clute and *The American Botanist* on fifty years of continued service to the popularization of botany. Both arrive at a golden anniversary together, for Mr. Clute has edited the magazine throughout its entire long life. During this half-century many magazines devoted to plants have lived for varying spans and passed into history, but *The American Botanist* has kept right on to Volume L. Its pages constitute a virtual history of botany and botanical progress for the twentieth century. Mr. Clute reviews these fifty years of botany in an article in the October, 1944, issue of his magazine.

Jack Miner Passes

On November 3, 1914, at the age of 79, Jack Miner, whose bird sanctuary at Kingsville, Ontario, Canada, has become a symbol of bird protection, passed away suddenly from a heart attack. His work will live on, however, for he had deeded his sanctuary, free of debt, to the Jack Miner Foundation, which, through his widow and three sons, will carry on the work. Funds are still needed to maintain the sanctuary through the Foundation and to assure the perpetuation of the hospitality so long extended to migratory birds.

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Nature in Print

By HOWARD ZAHNISER

WITHIN the past five years—and what years they have been!—Andrew Denny Rodgers, III, has published four solid volumes developing biographically a history of botany in America. The recent publication of the fourth, *American Botany, 1873-1892: Decades of Transition,* seems more an occasion for celebration than a simple event for notice.

Five years ago there was in no one book or set of books a connected or adequate account of the American development of this basic science—a science that has been the professional concern of many first-rate minds and, moreover, has attracted the amateur attention of a larger number of outdoor folk than any other with the possible exception of ornithology. Five years ago even the materials for such a work were scattered in many libraries, in many books and periodicals, and in many collections of correspondence.

Today both the professional scientist and the inquiring amateur can join in a thankful celebration of the remarkable achievement of one man who has searched out these materials, and written already four volumes. "The writing of a history of American science must proceed by contributions," he declares disarmingly in the preface to one of these volumes, and by this method he has indeed been making rapid progress toward such a history.

It is of curious interest, easily understood probably by the botanizing fraternity (and sorority), that Andrew Denny Rodgers was a lawyer—not a scientist or historian—when he first began to make these contributions. In 1940 he published *"Noble Fellow": William Starling Sullivant,* a biography of the father of American bryology, and that undertaking was partly explained by the fact that Sullivant was Rodgers's great-grandfather. Yet the book was far more than the chronicle of an illustrious ancestor, for the author, to the good fortune of his readers, became engaged with a zeal for tracing through the correspondence, writings, and associations of his hero the entire development of a science.

"Noble Fellow," undoubtedly to the satisfaction of the great-grandson author, remains Mr. Rodgers's greatest achievement in biography itself, but his development of the art of biographical science history has made considerable advances. *John Torrey: A Story of North American Botany,* published in 1942, and the more recent *John Merle Coulter: Missionary in Science* (see "Nature in Print" in *Nature Magazine* for November, 1944) were indeed rather adequate life histories of their central figures. Yet into their pages come so many of the botanical colleagues of John Torrey or John Merle Coulter that the biographies seem remarkably like the complaints of a professional man's wife, and now in Mr. Rodgers's latest book the botany has the title all to itself—although it might well have been, like its predecessors, labeled with the name of one man. *American Botany, 1873-1892* was predicted before publication to be a forthcoming work on Asa Gray, and not entirely in error either. Asa Gray's career after the death of Torrey gives the work the continuity that Rodgers achieved in his earlier works with Torrey himself and Coulter, and even Mrs. Gray appears in *American Botany, 1873-1892,* like a modest wife in the company of her husband's colleagues. Despite its different sort of title, the work takes its place alongside Mr. Rodgers's other books as otherwise unique examples of the history of a science written largely in terms of the correspondence and associations of the scientists.

"During the first three quarters of the nineteenth century," writes Mr. Rodgers, "John Torrey strode upon the botanical stage in North America. . . . The fact was that the country had been explored for its scientific resources only partially, and a very small part it was. Not even the materials had been gathered, let alone coordinated and systematized according to species, genera, and families. Some great man had to arise to accomplish the task; to accept the challenge of its leading role with zest and enthusiasm; to direct the energies of a continent as it sought to find what and where were its resources; to distribute for diagnosis and scientific descriptive determination the materials among competent authorities if he himself could not supply them. That man was John Torrey."

Similarly, one now might write that after two centuries of botanizing in America the science had been explored for its biographical resources only partially, and a very small part it was. Again, not even the materials had been gathered, coordinated, or systematized. Some man had to arise to accomplish these tasks. That man was Andrew Denny Rodgers, III.

Through these four books move all the great botanists of America and some not so great, or only in part botanists. Leo Lesquereux, who collaborated with Sullivant in work on mosses, is prominent in *"Noble Fellow,"* makes an appearance in *John Torrey,* and, as the great paleobotanist, becomes the subject of many pages in *American Botany, 1873-1892.* Amos Eaton, "the first great teacher of natural history in America," dominates an early chapter of *John Torrey,* and his strange career from prison to lecture platform provides some of the color with which this book is brilliant. Elsewhere in this work John Charles Fremont is depicted as a "young scientist and soldier" exploring the far west, and the great nineteenth century explorations of other regions are also described with primary reference to their botanical contributions, but not without regard for their color and romance. *John Torrey* does, in fact, appear to be an excellent general contribution to the history of nineteenth century America. From this book Agassiz and Gray, as well as Lesquereux and others, move on into *American Botany, 1873-1892,* which, although the latest book published, seems to be the one of central importance in defining the character of the science of botany in America and its achievements. Its basic contributions to the plant sciences that have meant so much to the national economy, the institutions through which it was developed, and its dignity and charm as a subject of research and speculation, are all here described and discussed in the human terms of the responsible men.

Invasion

By HELEN PETERS

Across this morning's early path
Are fairy metal trails,
My garden's small battalion
Of little armored snails.

In *American Botany, 1873-1892* there are hints of more such works by Mr. Rodgers to follow, and his readers will certainly wish him well in his further work. If it would not seem ungracious in the midst of gratitude for such contributions, one might ask for one thing more of Mr. Rodgers. His books would be ever so much more useful on the shelves after they have been once read if they included chronologies of the principal events they describe, if they included lists of the publications of the botanists with whom they are concerned, and if the indexes were considerably more detailed. And if this would seem an ungracious demand on the author, perhaps it might be suggested that the publishers or some library co-workers of Mr. Rodgers undertake the preparation of such appendices. Perhaps such an appendix in a later work could serve for the entire series. It is not that the works without these are not useful; it is rather their usefulness itself that makes these aids so earnestly to be desired.

For Mr. Rodgers has not only written books that are of great value, interest, and importance in and of themselves. He has also provided the materials for other works, and he has done this deliberately as a contribution to science historians. One of the works that will surely result is a one-volume history of

American botany told in terms of personalities for general readers. Mr. Rodgers has so clearly pointed the way to this, and has so adequately prepared the way, that when the present series of works are done (and the more of them the better) one hopes that Mr. Rodgers himself may go on to make from his monographs a manual for all.

"Noble Fellow": William Starling Sullivant. New York: G. P. Putnam's Sons. 1940. $3.50.

John Torrey: A Story of North American Botany. Princeton University Press. 1942. $3.75.

John Merle Coulter: Missionary in Science. Princeton University Press. 1944. $3.75.

American Botany, 1873-1892: Decades of Transition. Princeton University Press. 1944. $3.75.

Lake of the Eagles

Eagles Mere and the Sullivan Highlands. By J. Horace McFarland and Robert B. McFarland. Harrisburg, Pa. 1944. The J. Horace McFarland Press. 164 pages. 70 illustrations and end maps. $3.75.

To those who seek a summer vacation haven free from the noisy and noisome appurtenances of many resorts, Eagles Mere, Pennsylvania, has long offered a perfect answer. Set in the highlands of Sullivan County, atop a mountain two thousand feet above sea level, is a lake called Eagles Mere. One hundred years ago Judge John Richter Jones of Philadelphia, apparently the first to vizualize the lake and its surroundings as a place for summer recreation, so named it. Earlier it had been known as Lewis Lake for George Lewis, who established a glass factory on the lake shore in 1794. Gradually the resort use of this area became dominant, the lake and much of its surrounding land and forest being acquired and controlled by one company. For sixty years the policy has been to preserve the natural beauty of Eagles Mere, the ancient laurels and rhododendrons that fringe the lake, the forests and woodland paths that skirt it. The result has been a summer resort that is unique, and to which those who know it and love it return year after year.

Enthusiasts for this area—among them this reviewer—include J. Horace McFarland and his son, Robert. In this attractive and interesting book they seek to pay tribute to Eagles Mere, and the highlands in which it nestles. They have signally succeeded, in word and a profusion of picture. This book is at once a history, a guide and a descriptive story of the region. It will be treasured by all who have moments of nostalgia when away from Eagles Mere. It will be useful to any visitor to the region, whether a newcomer or a veteran. It is the Baedecker of the Sullivan Highlands, enhancing the enjoyment of one's visit there. The only bone we have to pick with the authors is that the book comes to use for review in November, and with the 1945 season still months away. Yet we can make a vicarious visit through its pages, so perhaps we should not complain.—R.W.W.

The Story of Eben

Eben, the Crane. By Alma Savage. New York. 1944. Sheed and Ward. 76 pages. Illustrations by Charles Keller. $1.50.

This is the story of a crane left behind up above Arctic Circle when his parents departed on their migration southward. Found by an Eskimo boy, Eben was turned over to Otto William Geist, naturalist and archeologist, who told the story to the author. So fascinating was it that, with a background of knowledge of Alaska, and with the aid of Mr. and Mrs. O. J. Murie, authorities on the wildlife of the Territory, the author felt that Eben's story should be told. The result is a delightful little Nature book.

Fish and Shellfish

Fish and Shellfish of the South Atlantic and Gulf Coasts is the title of Conservation Bulletin 37, written by Rachel L. Carson and brought out by the Office of the Coordinator of Fisheries. Ration points for meats have turned our attention more and more to our fisheries, and the region covered by this bulletin is important with respect to this resource. The South supplies us with practically all our shrimps, a third of our crabs, a fourth of our oysters and a number of other choice species nowhere else caught abundantly. The author discusses the importance of this fishery, its history and geography. She discusses the principal species, from mullet to bay scallop, and provides an appendix on the selection and preparation of fishes as food. Copies of the bulletin are available from the Superintendent of Documents, Washington 25, D. C., for ten cents in coin.

California Birds

Abundant California is the title of an attractive portfolio of colored pictures of ten wild birds of California brought out by *California Monthly*, alumni magazine of the University of California. The pictures were taken in color by William L. and Irene Finley, noted wildlife photographers, and enlarged, in reproduction, to about six and one-half by eight and one-half inches. These are mounted, making the pictures admirable for framing. The birds in the portfolio are the yellow warbler, wood duck, cedar waxwing, blue heron, horned owl, robin, rufous hummingbird, road runner, gull and eagle. Descriptive text accompanies each picture.

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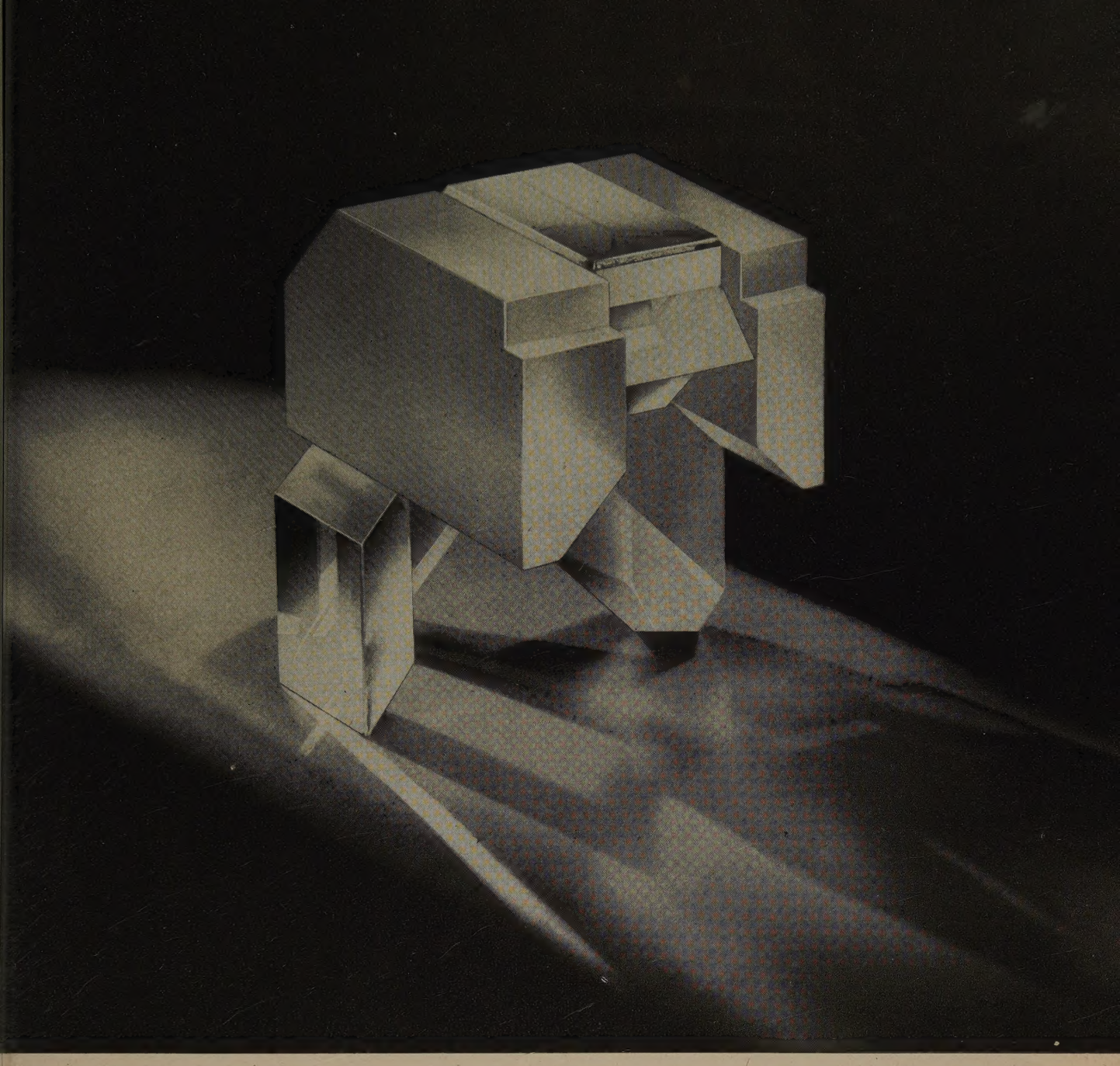

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BELL TELEPHONE SYSTEM

Contents Noted

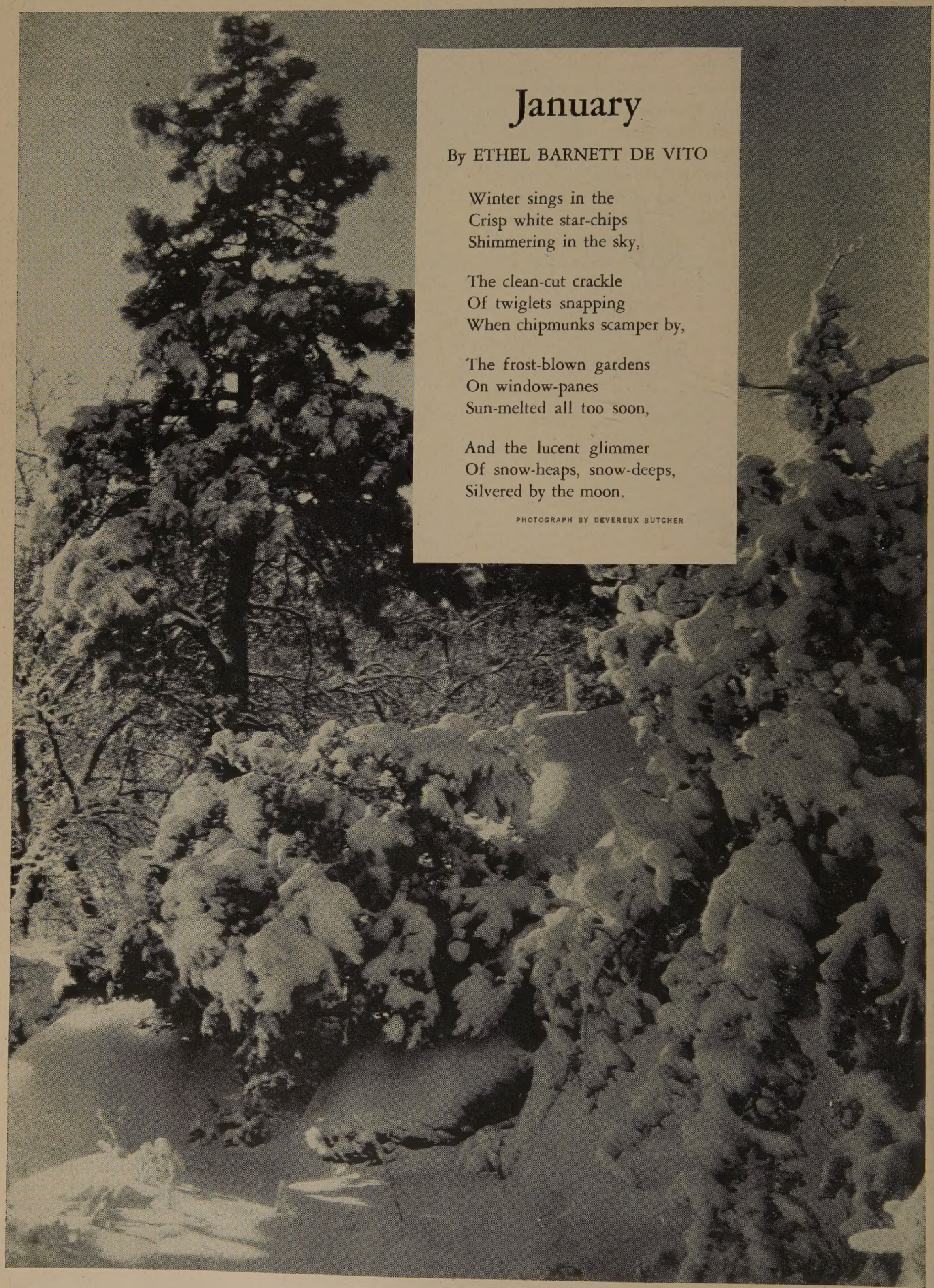
WESTINGHOUSE is doing a real public service through its annual science scholarships for high school seniors, and those handling the competition must get a real lift out of the imagination and individuality of the youngsters competing. From submissions by some 15,000 boys and girls, forty essays on "My Scientific Project" were selected and published in a little book entitled *Scientists of Tomorrow*. One youngster, Amber Charles Davidson of Lyman, Wyoming, has been working with invisible light, and won a scholarship of $2,400 to carry on his experiments. We like the resource of Nancy Durant of Alexandria, Virginia, who was working on fire resistant materials. She needed tungsten trioxide for her dipping solution. This was hard to get so she invented a machine to crush burned-out light bulbs and reclaimed the tungsten. We are glad she got a scholarship of $400. Twelve girls and twenty-eight boys, most of them from small cities, were the finalists—as bright a bunch of youngsters as ever was.

WE ARE not statistically minded, but we discovered two rather interesting facts once the index to the 1944 issues of *Nature Magazine* was compiled for inclusion in the December issue. We were surprised to find that we had used sixty-six poems during the year, a new high. We also discovered that during the year one hundred and sixty-six writers, not including our anonymous self, contributed to the magazine in 1944, several of them, of course, on more than one occasion. We would like to take this means of thanking them—beyond the appreciation expressed by modest checks—for their collaboration, and to wish them all a Happy New Year.

IN AN article announcing the opening of the season for trapping fur-bearing animals, the *Iowa Conservationist*, official publication of the Iowa State Conservation Commission, indulges in hyperbole from a viewpoint that, we suppose, we will never understand. "To those poor unfortunates," the story says, "who have never experienced the thrill of 'stringing steel,' the hardships and physical punishment that the trapper endures even in these days of television and airplanes seem a little on the nutty side. Be that as it may, trappers as a group are the most impatient of all outdoor enthusiasts for their season to open so that they can test wits with the fur-bearers and match their ruggedness against the weather, fatigue and pneumonia bugs." To our way of thinking, if there are any "unfortunates," they are the animals living out endless freezing hours, legs caught in the gripping jaws of a steel trap. It is with these that the trappers are matching wits, but who is taking the "hardships and physical punishment?" And it is rather hard to believe, as this story further adds, that "every follower of the trap line experiences all the thrills and healthful recreation common to the sports of hunting and fishing."

ACCORDING to John Ekdahl of Renovo, Pennsylvania, something had been making off with the eggs in the Ekdahl chicken coop. Several days of watching were fruitless, then finally two thieving rats were surprised in the act. "One," writes Mr. Ekdahl, "was lying on its back with a nice white egg clutched tightly and cushioned on its furry belly. The rat's head was raised and arched over the egg. Black, beady eyes, with a hint of deviltry in them, watched the confederate rat, which had the egg holder's tail firmly in its jaws. By heaves and jerks it was dragging its partner and the egg toward a hole in the wall. For perhaps a minute the one rat watched its pal, then dropped its head back on the floor with a self-satisfied air and began to survey the ceiling of the coop. Its roaming eyes, now taking in more territory, saw me. It seemed as though I could see a look of concern replace one of gay composure. The two black eyes bulged. The egg rolled to the floor and the two rats scrambled for the hole." This is an oft-told story, and one that most naturalists find it hard to believe. They point out that the rat would have had a most uncomfortable time on his trip with the egg, what with his fur being rubbed the wrong way and with his companion's teeth meshed in his tail. Besides, a rat could roll an egg much more easily than carry it by this sort of acrobatics. Yet Mr. Ekdahl tells the story for fact, and you can take it or leave it.

In these changing times there is reassurance of permanence in receipt of *The Old Farmer's Almanac* for 1945, the 153rd continuous year of publication. We enjoy all its contents, but get the most nostalgic thrill out of the old-fashioned display in the advertisement of Jordan Marsh Company of Boston, where we were outfitted with our Sunday-best blue serge suit, way back when. R. W. W.



January

By ETHEL BARNETT DE VITO

Winter sings in the
Crisp white star-chips
Shimmering in the sky,

The clean-cut crackle
Of twiglets snapping
When chipmunks scamper by,

The frost-blown gardens
On window-panes
Sun-melted all too soon,

And the lucent glimmer
Of snow-heaps, snow-deeps,
Silvered by the moon.

PHOTOGRAPH BY DEVEREUX BUTCHER

"The wild horses probably tolerated him more than they loved him, but in their company he was safe from wolves."

Self-protection, loneliness, propinquity, and other more elusive reasons, account for—

Strange Animal Friendships

Illustrated by Prentice Phillips

By J. FRANK DOBIE

IT WOULD not startle me to see a lion and a lamb lying down together—provided each had been cut off from its kind, and the lion had made the acquaintance of the lamb while not hungry. Some animals, of course, are notably more gregarious than others. I shall never forget the cry of distress I heard one late winter evening from a little blackbird that for a minute or two had become separated from a flock of thousands that was shifting about in a field. On the other hand, the lone wolf may be tracked for months without finding where he has joined his mate. Nevertheless, nearly all animals yearn for companionship, and when they cannot consort with their own kind they sometimes form fast and fiercely devoted attachments to creatures utterly foreign.

The otter of Britain is usually harried by dogs and men, but Lockwood Kipling tells how a Scottish gamekeeper once trained an otter to run with his dogs, which formed a friendship for it. It was the best "hound" in his pack.

A ranchman out on the Frio River in Texas used to have a pet buck that had been raised from fawnhood with the house dogs. It formed a particular friendship with a massive mongrel known as Old Blue. The two were inseparable. The buck would paw other dogs away from food while Old Blue gorged himself. When the pack hunted, sometimes five and six miles out from the ranch, the buck would accompany them, leading in the chase after wolves or other animals. When he was four or five years old, the buck took to ranging far away and alone, being gone for weeks at a time. The only way to entice him

"Morning and evening, when bob-whites were calling on every side, he . . . stayed close to the chickens."

back to the ranch was to lead Old Blue to his vicinity. Once he sensed the dog, he would go straight to him and accompany him back to the ranch, there to stay until the call of the wild tolled him forth again.

I have heard of a javelina, or peccary, raised as a pet by Mexicans, that took up with the dogs and became a hunter with them. I knew one peccary that, captured as a pig and suckled by a goat, became as vigilant a care-taker of a herd of goats as any shepherd dog.

The dogs used by Mexicans for shepherds are nearly all mongrels out of rangy blood. They could have become sheep-killers, yet because they have been suckled as pups by nannies or ewes, and because the goats and sheep have become used to them, they are as one with their charges. I know of a kid that was taken from its flock and raised as a pet with some ranch dogs. The dogs had each other for company, but they seemed to love the goat, as it grew up, like a brother. When they rushed out at night barking at mocking coyotes, the goat would rush with them, as brave as a lion.

W. H. Hudson, in *Idle Days in Patagonia*, tells of a wild heifer that broke away from a herd being driven along the coast and swam to a small island inhabited by wild hogs. She was considered lost, but about a year after her escape a native who went to the island to cut rushes came upon the cow stretched out asleep with the whole herd of hogs, twenty-five or so in number, piled and heaped around her, each one, apparently, ambitious to pillow its head against her. She was almost covered up. On various other occasions the cow was seen, always in close company with the hogs who had adopted her.

Almost any creature taken away from its kind and from its habitual environments will readily take up with another form of life. Billy the Kid set out on one of his desperate rides on a wild horse that had never before been saddled. After he had kept the animal a day and a night in strange mountains, cut off from all other creatures, it would follow him like a pet and was uneasy out of his presence.

These unusual attachments are at times, no doubt, motivated by the instinct for self-protection. On the plains of Kansas, about 1870, a traveler named W. E. Webb observed a feeble old buffalo bull, an outcast from his own herd, keeping company with a band of mustangs. The wild horses probably tolerated him more than they loved him, but in their company he was safe from wolves. On the other hand, Buffalo Jones, who did much to preserve the buffalo from extinction, came into possession of a two-year-old colt—probably a cut-off from some band of mustangs—that had been ranging with a particular herd of buffaloes for about a year.

When I was a boy living on a ranch thickly populated with bob-whites, a certain quail took up one summer with our chickens, going to roost with them in the evening in a chicken house, although it is the nature of quail to roost on the ground. To see this plump little bird cuddled on a pole beside a ponderous Plymouth Rock hen was a comfortable sight. Morning and evening, while bob-whites were calling on every side, he, apparently oblivious to his kind, stayed close to the chickens. I do not know what became of him, but thirty years after he had gone the way of all flesh I learned that a solitary bob-white, in a region replete with bob-whites and in a county adjacent to mine, had taken up with a flock of young tame turkeys. It was sleeping with them in a tree by night, and by day following them about, eating grass seeds while they were catching grasshoppers.

There is a mothering, protective instinct in a great many animals, stronger in certain individuals of a given species than in others, that often leads to remarkable associations. An orphaned calf out on the range is occasionally adopted by a cow. Usually the dogie will try without success to suck first one cow

and then another; once in a while, however, a cow that it approaches will allow it to share her milk with her own offspring. It is on record that in 1934 an orphaned moose calf in Wyoming was adopted by a milch cow.

Mules are notorious for their insane passion for company. A mule will all but break its neck in order to get with the bell mare. Sometimes mules, particularly young mules, will run a calf or colt to death—not, apparently, with intent to kill, but from desire to get it to take up with them. One of the most passionately devoted foster mothers I have ever known of was a mare mule that had adopted a Brahman calf. Both were owned by a friend of mine in southwest Texas. One day while riding on his ranch he came upon the calf sucking the mule, and soon discovered that the mule was actually giving milk. The calf's mother had died. Whether it or the mule had begun the association nobody could say. Exercise of the mammary glands induced a flow of milk in the mule. She raised the calf and it went on sucking until it was far past the usual age for weaning. The mule was simply fanatical about it. I read recently of a similar case in another part of Texas. In this latter instance, when the rancher approached the calf the mule kicked him on the jawbone, breaking it.

Just as in human beings, there are in animals all sorts of opposing tendencies, dual inclinations, or contradictory instincts. A dog with nursing pups pursued a female coyote to her den and helped kill it. The coyote had pups, and when they were brought out of the hole, the old dog whined and nosed them in a most sympathetic manner. One little coyote was saved and put with the dog's puppies. She nursed it and "flead" it along with her own young, and it grew up a boon companion of the dogs. However, its propensity for killing chickens finally proved its ruin.

H. I. Dillaway of California reports that on one occasion when a mother doe was killed by a train he took the fawn and placed it near a setter that had lost her pups and was still heavy with milk. As the fawn began scenting near her, the setter rolled over as an invitation for the fawn to feed. It immediately began to nurse. Thereafter it had a devoted foster-mother that often fought other dogs away when they seemed to menace her adopted baby.

I have seen cats stalking squirrels and I have no doubt that if a young squirrel came within reach of a hunting cat she would devour it. Yet a California mother cat nursed and licked some young orphan squirrels that a man slipped in among her kittens.

On fox farms, cats deprived of their kittens are commonly used as wet nurses for little foxes. The convicts on a state farm in east Texas knew nothing about this when they raided a squirrel's nest and captured some little squirrels to feed a pet tabby that had just kittened. When they gave them to her, she promptly adopted them and soon had them feeding along with her own infants.

At the village of Oakhurst, Texas, a family of children had as their chief pet a female dog that had not had puppies for about a year. One day someone gave them three tiny squirrels. They were overjoyed at the prospect of raising them with medicine dropper and bottle. First, they lugged in a good-sized box and shut the squirrels inside. Before they knew it, their pet dog was inside also, claiming the little squirrels as though they were her own offspring. They suckled her and she gave milk. She reared them successfully. Before the squirrels arrived, she had been on the best of terms with a cat, but after she adopted them she ceased all comradeliness with the cat and would drive it away in a fierce manner if it came too near her adopted ones.

Although no one need believe that the she-wolf suckled Romulus and Remus, parallels to which persist today in the traditional lore of India, there is in the story nothing foreign to the mothering nature of many animals. Kropotkin, the great Russian social

"As a captive the fawn had no other playmates; the kittens wished for no other society."

philosopher, wrote a book called *Mutual Aid* in which he adduces scores of cases exemplifying friendly co-operation between animals, principally between individuals of a given species; but the relationships we are considering are of a different character. Nor do they belong in the category of uncommunicative, often resented, associations whereby one animal uses another for advantage, the coyote, as I have seen, dogging the badger to catch rats the latter runs out of holes, and the crow following the wolf in the hope of getting a morsel from its kill.

Some animal friendships are not to be accounted for either by the theory of protection or the theory of isolation. They develop, like many human friendships, through accidental propinquity. I have read of a hen that took to roosting in the stall of a stallion. She would roost nowhere else, and if she were removed the stallion would grow restless and fierce. The two were devoted to each other.

In 1933 a resident of Duncan, Oklahoma, who kept a cow that was often barked at and tormented by dogs and that he staked out by day on vacant lots, discovered a neighbor's dog trying to sleep on the straw in the cow's shed. At first the cow tried to hook the dog, Buck by name, and keep him away. Finally Buck had his will. Then he took to keeping company with the cow while she grazed. If a strange dog appeared, he would chase it away. The dog and the cow grew to be inseparable companions, the dog leaving her only long enough to go home for his meals.

One of the prettiest sights of Nature in my memory is of a spotted fawn and two kittens lying on Bermuda grass in the sunshine. The fawn would stretch out its delicate head along the ground, and on either side of it, cheek by jowl, the kittens would stretch out also, all three cat-napping. All three would drink milk together, the felines lapping from a saucer while their mistress held a bottle for the little deer to drink from. When the fawn nibbled grass, the kittens would place their forefeet up on its legs and shoulders or on its head. As a captive the fawn had no other playmates; the kittens wished for no other cat society.

On a California farm a Canadian goose and a lamb recently took up with each other, the lamb coming to the goose's honk and the goose responding to the lamb's bleat. Forest rangers discovered a jack rabbit near the Grand Canyon keeping company with a doe.

A Texas rancher some years ago raised a litter of hogs and a litter of dogs together, the pigs and pups playing with each other promiscuously. One day he trapped a fox, tied up his grown dogs, and then released the fox, which was uninjured, for the pups to follow. At first it took to a tree. Then it jumped out, the pups chasing hard. When one caught up with it, the fox turned suddenly to fight. One pup let out a yelp for help. It happened that three of its playfellow shoats were rooting near by. Hearing the cry, which persisted, they came running, attacked the fox, and were killing it when the rancher pulled them off.

In 1847 an Englishman named John Palliser came to America to hunt and to gather a menagerie. He accumulated several buffaloes, a pet bear, an antelope that the bear considered a friend, and various other animals. When he reached the docks at New Orleans, as he relates in *The Solitary Hunter*, he sent a man ahead leading the antelope, he himself following with the bear. Suddenly a huge mastiff sprang for the antelope. The bear lunged forward, slapped the dog over, and would surely have killed it had it not managed to get away.

The bear's protection of the antelope and the rush of the hogs to the distressed pup are essentially no more foreign to Nature than a dog's guardianship over a child belonging to his master. If dogs, elementally predacious towards sheep, become their protecting shepherds, we need not be surprised that a lioness was so devoted to two dogs belonging to a Michigan policeman that she pined away and died after their death. Given the opportunity, almost any combination may develop between one kind of animal and another, just as between man and any kind of animal. It seems to be part of Nature's plan.

★

Tribute

(To Jack Miner)

By GERTRUDE E. WHEELER

God guard with special care
The little feathered folk,
How sadly now they miss
His shining presence there!

A crown of love he wore,
This Prince of Nature's Realm;
Gifts for wildwood children
In kindly hands he bore.

Oh, may the Master mind
Teach men to know his joy
In helping helpless things;
Please, God, make men more kind.

Mr. Wise Guy—The Indian Mynah

By E. D. NEFF

IF THE bird kingdom should ever become a democracy either the North American eagle or the great condor of the Andes would be logical candidates for the presidency, but it is likely that the loud-mouthed, sociable Indian mynah bird would be charged with getting out the vote.

The mynah hails from southeastern Asia, but it is closer in temperament to a Tammany wardheeler than to the dreamy-eyed mystic of the East. It is smart, self-confident, aggressive and noisily human. Its garb has a snap and flash that is faintly Broadway—a rich wine-brown, deepening to black on the head, neck and upper breast. In flight there is a conspicuous white slash across the wings reminiscent of one of Jimmy Walker's famous scarfs rippling in a brisk election breeze. Its bill is a flashy yellow, and its underpinnings are neatly sheathed in spats and leggings to match. The mynah even has the familiar fleshy wattle below and behind the eye—a trademark of politicians nearing the end of a tough campaign.

Mynah birds, which belong to the starling family, and are about the same size as our familiar alien, are common throughout the Pacific islands, where they are variously praised for insect and worm destruction, adored as pets because of their comic tricks and mimicry, or cursed for sundry alleged crimes. Nobody is neutral about mynahs, and they have won an amused following among thousands of servicemen in the Pacific.

One Army private is said to have raised a baby mynah for a gift to a dearly-beloved sergeant. However, the fledgling quickly lost the giver whatever profit he expected by repeating something that sounded to the sergeant very much like an ancient Army obscenity. The private avowed he was innocent, but the sergeant pointed out that mynahs are not natural linguists and probably unfamiliar with Army profanity anyway.

"Besides," the sergeant complained, "it wasn't what he said, it was the insulting *inflection*."

Like any smart politician, the mynah understands the merits of a good show and is quick to take advantage of a fresh audience. Contingents of servicemen arriving in the Pacific islands find almost daily amusement in one of the mynah's best stunts—the garrulous ring battle. Despite its frequency, this phenomenon still puzzles even close students of the bird. Suddenly, and for no clear reason, a dozen birds will gather on the ground and circle a single bird, or a pair. Then sounds a battlecry that to Americans is nothing less than "Oh Yeah, Oh Yeah!" Quickly there follows a gorgeous knock-down and drag-out fight, during which the spectator birds leap up and down like Mexican jumping beans.

When the fighters tire, they lock claws or beaks, lie down for a breather, then begin anew. During any phase of the battle one or two onlookers may join the fight, which then quickly becomes very like an old time street brawl.

But it is all a complete fraud, for no blood is lost, nor a feather dislodged. Even the much more earnest

The mynahs love to fight vigorous but bloodless battles to an audience of their fellows, who surround the contesting battlers, jumping up and down in excitement at the contest.

fights for nesting sites are bloodless, although the terrific screams seem to promise general casualties.

Some ornithologists explain the mysterious ring battles by supposing that one of the contestants is an unwanted stranger, or that perhaps just one of the flock is being put on the spot. The battles do not appear to be prearranged, and some think they are just part of the mynahs' normal program of raising the devil, another detail of which is cat-baiting.

Nobody has ever told the mynah birds they should fear cats, and apparently the suggestion would appear ridiculous to them anyway. Cat torture always provides relief from a dull afternoon.

George C. Munro, a widely-known bird authority in Honolulu, describes this activity in a recent article in *The Elepaiö*, the journal of the Honolulu Audubon Society:

"Two birds will sit on a twig just out of reach of a cat and scold it so vociferously that the cat becomes confused and leaves its food for a second. The mynah then dives down, grabs the meat scrap and is off before the cat can turn around."

It is thought that this trick attains the maximum insult to the cat.

One of the most spectacular habits of the mynahs is their gathering in huge flocks at evening, reminding the more traveled servicemen of England's famed rookeries. The mynahs will settle like a black shroud on some huge banyan or mango tree and appear to hold a bona fide political convention. Each bird seems to have an appointed roost, and their cries resemble "move over, move over, make room."

The persistent chatter that is always a part of these sundown conventions has suggested to imaginative bird students that "boss" mynahs are assigning definite "beats" to individual birds for the next day's insect hunts. The resemblance to a political convention is increased by the sudden rise and fall of raucous clamor—the same crescendos of sound that greet favorite sons in smoke-filled convention halls.

To insomniacs, however, it is just another racket to be added to the radio and the amateur saxophonists —for at daybreak the chattering begins anew.

Because of his loud, boastful cackling, and his strutting, cocksure manner, the mynah has attracted unfavorable attention from persons who know little or nothing about the bird, but are sure it must be a wretch. It is accused of every misbehavior from nest-robbing down. Some of the more frequent charges are hostility toward other birds, spreading of weed seeds and carrying bird diseases.

Possibly the most serious accusation is the first, for shortly after the mynah was imported to Hawaii in 1865 it was suspected of destroying native forest birds by attacking them physically and invading their nesting places. This charge is still made. However, Mr. Munro, who has studied the mynah and other birds in Hawaii for more than (Continued on page 50)

Several elms, once forming a shady arch over this avenue, have fallen victim to phloem necrosis. Note the absence of leaves, although this picture was taken in the summer. Such scenes as this are already becoming typical of public thoroughfares in the Ohio Valley watershed area, and may spread.

A mysterious disease that baffles scientists threatens the Ohio Valley watershed with—

A Lost Generation of Elms

By KATE HARRIS

EVERY American white elm in the Ohio Valley watershed has been marked for death—a death destined to take place within the next ten years.

So quietly, swiftly and sophisticatedly has an invisible and unrelenting murderer marked them that detectives, attracted to the case from far-off places, have journeyed to the scene of the crime, viewed the murderer's handiwork with amazement and returned to their offices baffled.

If you live in the southern parts of Ohio, Indiana or Illinois, southeastern Missouri, western Tennessee, Kentucky or the western part of West Virginia, the chances are that you are harboring the criminal in your own backyard.

Investigators, ignorant of the actual name of the murderer, have given him, for the present, the alias —"phloem necrosis." Necrosis, of Greek derivation, means "death of tissue"; the tissue doomed is the phloem, conductor of the tree's food supply.

Recall the appearance last summer of the elm in your own vicinity. Did the leaves turn yellow or brown and curl up as if affected by the heat? Just this terrible drought, you probably said. Or, perhaps because of the striking similarity between the external symptoms of phloem necrosis and the Dutch elm disease, you thought your tree had developed it.

To carry the examination further, you would seek to discover if the inner bark of the buttress roots, or of even the lower trunk, was a yellow, yellowish-brown or "butterscotch" color? Odd to say, in phloem necrosis this discoloration never occurs in the wood, and is but seldom found in the branches. The bark must be examined immediately after detaching, however, as even healthy elm bark will become brown after brief contact with the air.

Now, confine some of the phloem in a small, stoppered vial or merely hold a bit in your closed hand for a few minutes. Is there a wintergreen odor?

If your tree has these symptoms you are relatively safe in assuming it is a victim of phloem necrosis.

What can you do about it? Well, frankly, not much —that is, right now, anyway. At least, though, you

will be well enough informed not to become prey to the numerous quack tree doctors, who the U. S. Department of Agriculture tells us are springing up in the region, and who are well equipped with a variety of pseudo "tree injections" and "sprays" guaranteed to restore your elm's health.

"These 'aids,'" says Roger U. Swingle, associate pathologist of the U. S. Department of Agriculture's Forest Pathology Field Office, "are absolutely no good. Here at the experiment station in Columbus, Ohio, we've tried different fertilizer applications and methods of pruning, as well as the usual spraying preparations and they've all proved ineffective beyond a doubt."

A virus believed carried by one of the sucking insects transformed, in a few months, the tree at the left from a condition as healthy as that of the unattacked elm at the right.

"Neither," urges Mr. Swingle, "believe those who come to you with soft words about treating the soil. As far as we can tell, there is no basis for the belief that the malady is spread by diseased soil. Here healthy trees planted in earth known to have been exposed to the ailment have unfailingly remained in good condition—even when they were planted in a half-and-half mixture of good soil and diseased roots. Nor has any type of inoculation now known been of any avail."

Phloem necrosis usually reaches its peak in July or August. Throughout the summer months the toll is great, whereas in the winter the disease becomes dormant.

"Most trees," claims Russell T. Irvin, tree contractor for the city of Dayton, Ohio, "die within a year to a year and a half, although we have had cases where they were completely consumed in three or four weeks after appearance of the first symptoms. Others linger as long as two years. And there is no record of a recovery, once a tree has contracted it."

The American red, or "slippery," elm has proved resistant so far; nor have the Scotch, English and Chinese types yet been infected.

Although the epidemic proper exists in the areas known as the Ohio Valley watershed, the U. S. Department of Agriculture has had reports of the malady as far south as Jackson, Mississippi, and it greatly fears that unless some control can be found soon, the East and parts of the West may also be ravaged.

Experts now at work on the problem believe phloem necrosis to be caused by a virus, because no visible parasite has been found, although the disease is highly infectious. It is truly a baffling problem. So far, they have been able to transmit the disease from one tree to another in the laboratory only by grafting. But, strange to say, the grafted tree develops the trouble only if the graft is successful. At no time has a tree unsuccessfully grafted, or a nearby tree, been infected.

Clues indicate, according to investigators, that the culprit responsible for spread of the disease may be one of the sucking insects. Just which one is not known.

Consequently, on the grounds of the experiment station one comes upon a curious sight. Attached to rows and rows of elm seedlings planted in zinc buckets are cloth bags, in each of which buzzes one species of the more than one hundred insects common to the elm and its usual surrounding plant life. After the insects have feasted themselves upon the delectable offerings of the seedlings for around ten days, the trees are transplanted to protected areas, where their development is painstakingly watched. It may be a year—maybe two or three—before any signs of the disease occur on these seedlings. Then, too, there is always the possibility that none of the insects yet tested is responsible.

Mr. Irvin expects phloem necrosis to take 20,000 elms in the city of Dayton alone this year; Columbus authorities think they are likely to lose at least 10,000. Using the estimate of two of Ohio's larger commercial tree companies that the cost of taking down each dead or dying tree will average $75, it looks as though phloem necrosis is going to cost Dayton $1,500,000 this year; Columbus, $750,000. And these two cities, of course, are only drops in a very large bucket!

The picture does look rather dark. More than that—it was hopeless until Nature herself pointed a way out.

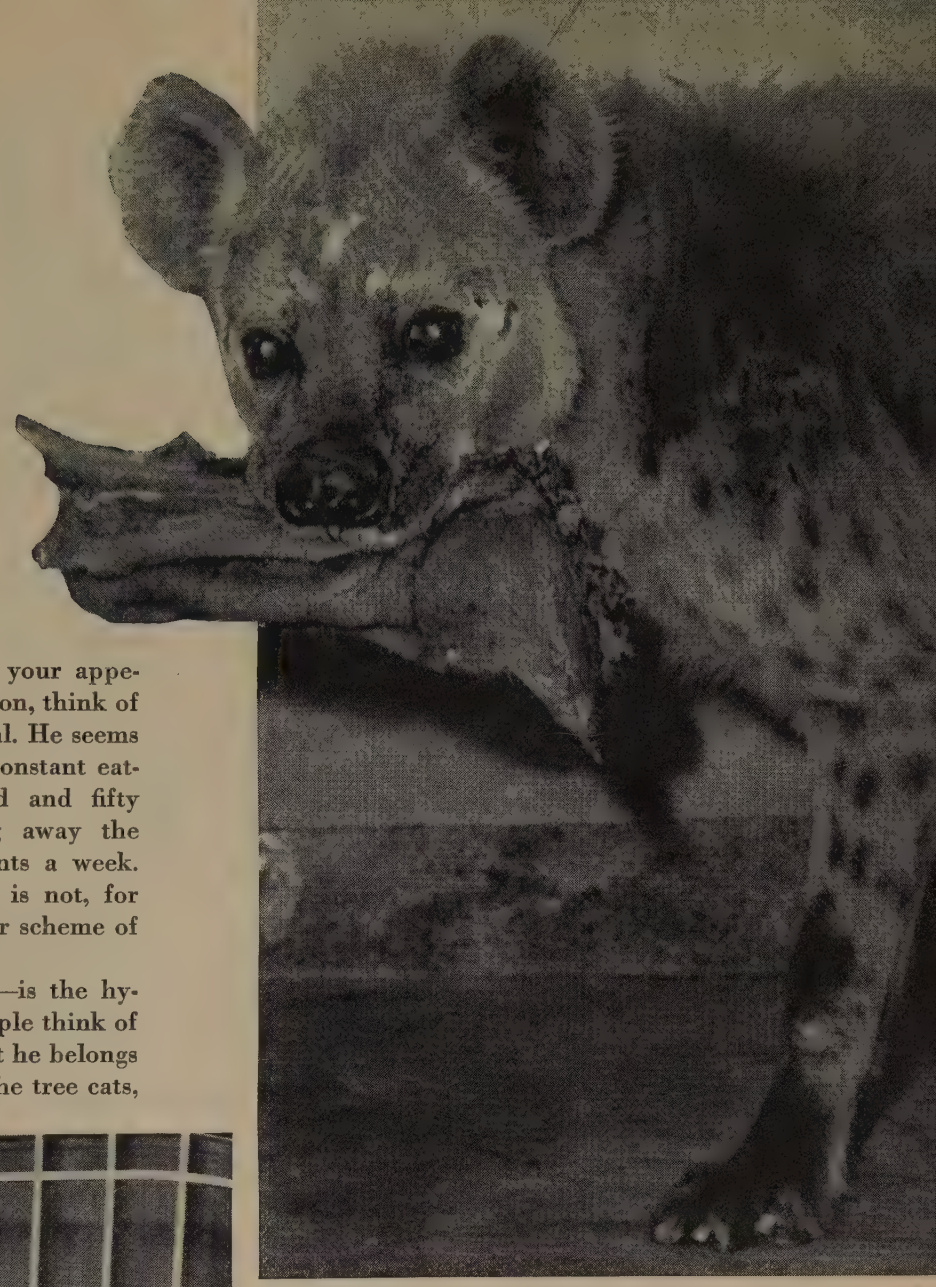
Back as early as 1893, H. Garman, of the Kentucky Department of Agriculture, described the symptoms of a disease taking the American elm in and around Frankfort. Although the descriptions are inadequate for positive identification, most authorities believe it to have been phloem necrosis. In 1912 S. A. Forbes, of the Illinois Department, reported that the disease described by Garman had been occurring in Illinois since 1882.

The U. S. Department of Agriculture has sent representatives to investigate the situation existing in the areas mentioned (Continued on page 50)

Seeming to live to eat, the hyena earns full title to the name of—

Perpetual Appetite

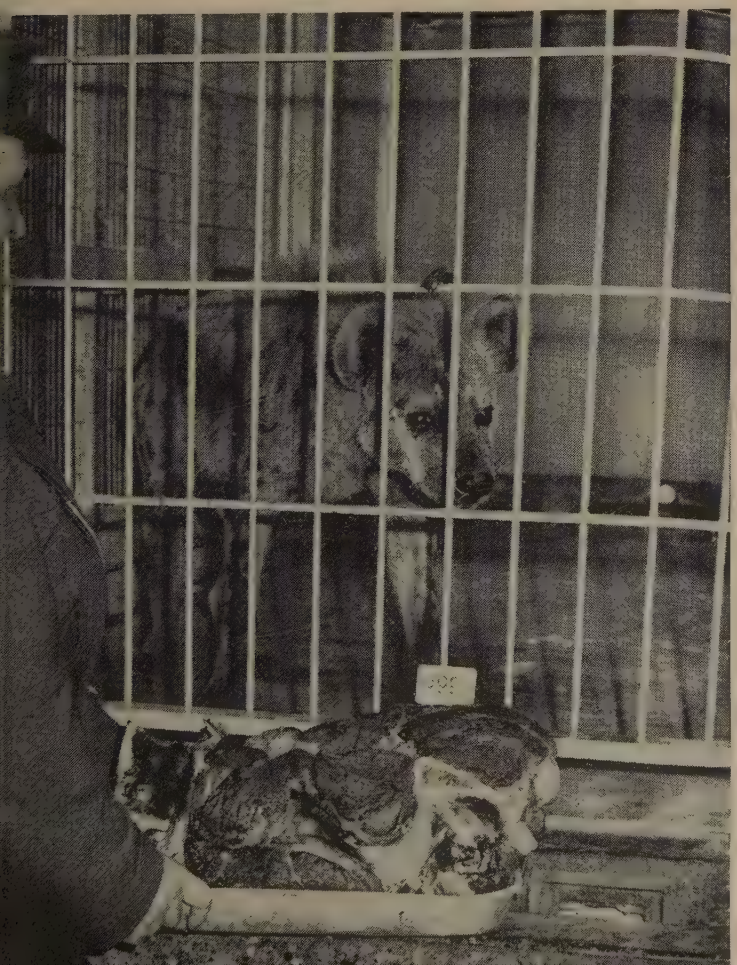
By HOMER F. SNOW



If the hyena had to have a ration card he would be in a bad way because he will consume the equivalent of 1500 points a week. However, his horse meat diet is ration free.

WHEN shrinking ration points put your appetite into a state of perpetual emotion, think of Nature's perpetual-appetite animal. He seems to have but one point to his existence—constant eating. Weighing only about one hundred and fifty pounds, he thinks nothing of tucking away the equivalent of fifteen hundred meat points a week. Although his meat is pointless, his life is not, for Nature has a definite place for him in her scheme of things.

This animal—Old Perpetual Appetite—is the hyena, as unlovely as he is hungry. Most people think of this fellow as being related to the dog, but he belongs to the group Aeluroidea, which, besides the tree cats, includes the hyenas, civets, mongooses, and a few others. His head is massive, his jaws powerful, and his teeth large and strong, a combination fitting him for his scavenging task.



There are two distinct types of hyenas, known popularly as the striped and spotted hyenas. The striped animal, which bears the scientific name of *Hyœna hyœna*, is the smaller animal, usually about two feet high at the shoulder. It ranges over a large part of North Africa, and is found in south-western Asia and in India, holing up in caves and burrows by day and hunting by night. A species found in Africa, south of the Zambesi River, is known as the brown hyena, *H. brunnea*. It is larger than the striped animal, but its habits are much the same.

The spotted hyena is known to science as *Crocuta crocuta.* It is larger than all other species, has a pattern of dark spots on its tawny-yellowish coat, rounder ears, and softer hair. It is found only in Africa south of the Sahara Desert, but its habits are like others of its kind, except that it is bolder and less solitary.

This animal will invade camps of travelers, as my father can testify. He was on safari in Kenya Colony, and one night, when camp was made and pots and pans hung on the lower branches of trees, the party retired. At sun-up the cook, in great excitement, aroused the camp. He pointed to the trees where our cooking utensils had hung, then to the ground. There were the crumpled remains of pots and pans, chewed and squashed because Perpetual Appetite had detected an odor of grease on them.

Natives and hunters alike detest this ill-proportioned beast. His short hind legs make him travel with a slinking slouch, or, at best, with a shambling gallop. He will molest burial grounds of natives. While he will enter camps at night, he will flee at the slightest sign of danger. He is not often seen in person, although his tracks are often found where he has been scavenging the kill of lions. His wild, satanic laughter will be heard at night, although I would prefer to call him the "wailing hyena" instead of the usual popular name of the "laughing hyena." There is nothing funny about him; he is too ugly. He works the "graveyard shift," his wailing at sundown calling together his pack and announcing his nightly quest.

For all his slovenly, ungainly and repulsive looks and habits, Nature has use for those bone-crushing jaws. She has assigned *Crocuta* and his allies to clean up the wastes left by other carnivorous animals on the veldt and in the forest. For this assault upon carrion she has supplied him with an insatiable appetite, a stealthy and cunning nature and furtive ways that serve to keep his scavenging clan sufficiently numerous for the task Nature has assigned him.

★

Helping Hepaticas

By EDWIN F. STEFFEK

HEPATICAS, with their curious furry buds, opening down among the leaves, are a signal that winter is over and spring is on the way. Unfortunately, however, although originally common, they are now fast disappearing and steps should be taken to preserve them.

There are two distinct species—*Hepatica acutiloba,* which has sharp-pointed leaves and likes a more or less neutral soil, and *H. triloba,* which has more rounded—although still three-parted—leaves and requires acid growing conditions. However, if other conditions are favorable, both can often be grown in a mildly acid soil with satisfactory results.

The foliage is evergreen, the old leaves living over winter and surviving until replaced by the new ones in spring. The flowers are generally a light blue, although plants have been found with white, pink or purple blooms.

Hepaticas do best when the land is well-drained. They need some shade in summer, that of high-crowned trees being best. There should also be plenty of leafmold in the soil, and the plants should not be moved too often.

Hepaticas may be lifted in the spring after blooming and divided carefully, although seed, if properly handled, will produce plants in larger numbers. One must watch carefully to catch the seed as soon as it is ripe in May or June, as it is easily lost. Sow it at once in flats of prepared soil. Germination takes

place in the fall, but nothing shows above the surface until spring, when two cotyledons or seed "leaves" appear. The second year small tri-lobed leaves appear and flowering usually commences the third year.

The round-lobed species is often the weaker grower, but appears to be found over a wider range. Some botanists consider it to be the same plant as that found in parts of Alaska, Europe and Asia.

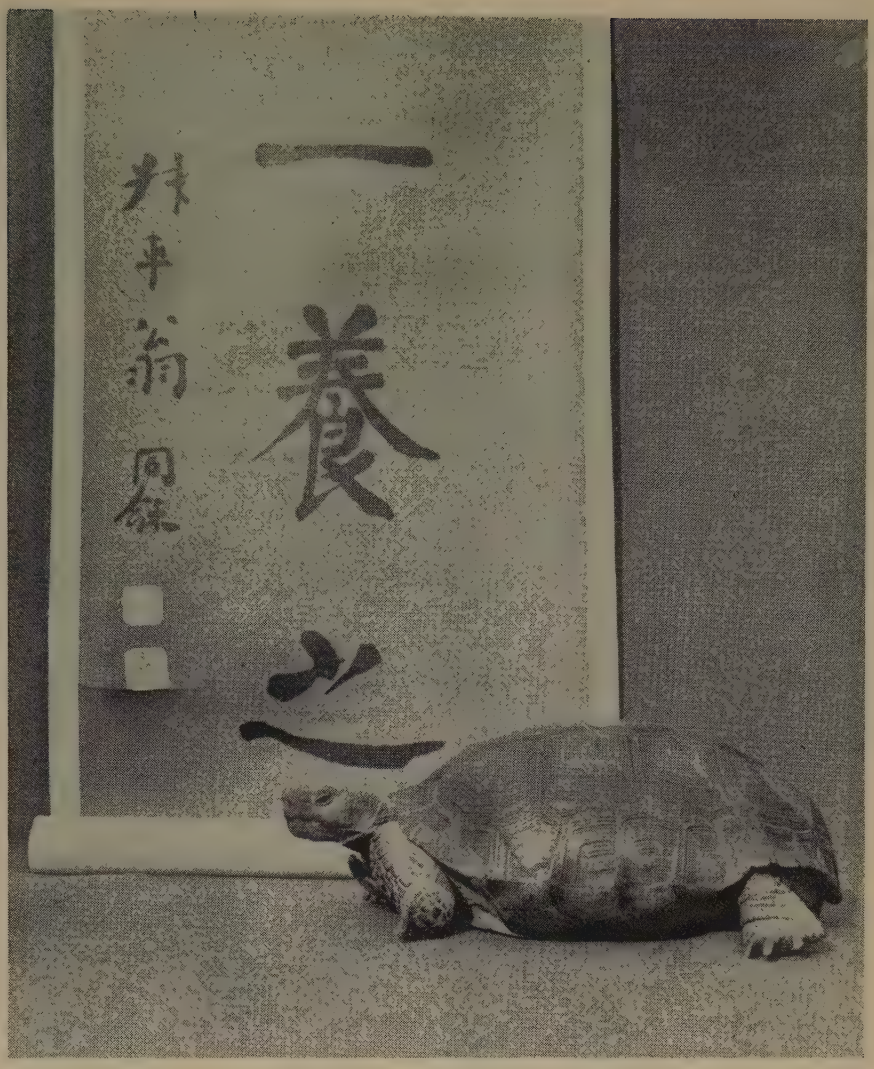
Tortoises go on forever—or so it seems—and are entitled to be called the—

Oldest Inhabitants

By ANNA C. WINLOW

Photographs by William Hanson

★



From earliest times the tortoise has held a venerated place in China. Here one poses against a Chinese poem that reads:

"I live in a desert
And have no care.
I am in silence
But not distressed."

HE AND his partner are just waking up. They are waking up, if I must say it, in my bedroom—and their sleep has been just five months long.

Today is the thirty-first of March. Tomorrow I trust they will welcome a sunny stroll and a vegetarian feast in my fenced garden; today the larger has broken his five months' abstinence with a half pint of water and some spring greens from my hands.

I say "he" of my present two chelonian intimates advisedly. They are United States desert tortoises, genus *Gopherus,* the genus whose three species are our closest American relatives of such international celebrities of age and size as "the tortoise that saw Napoleon." And both are males.

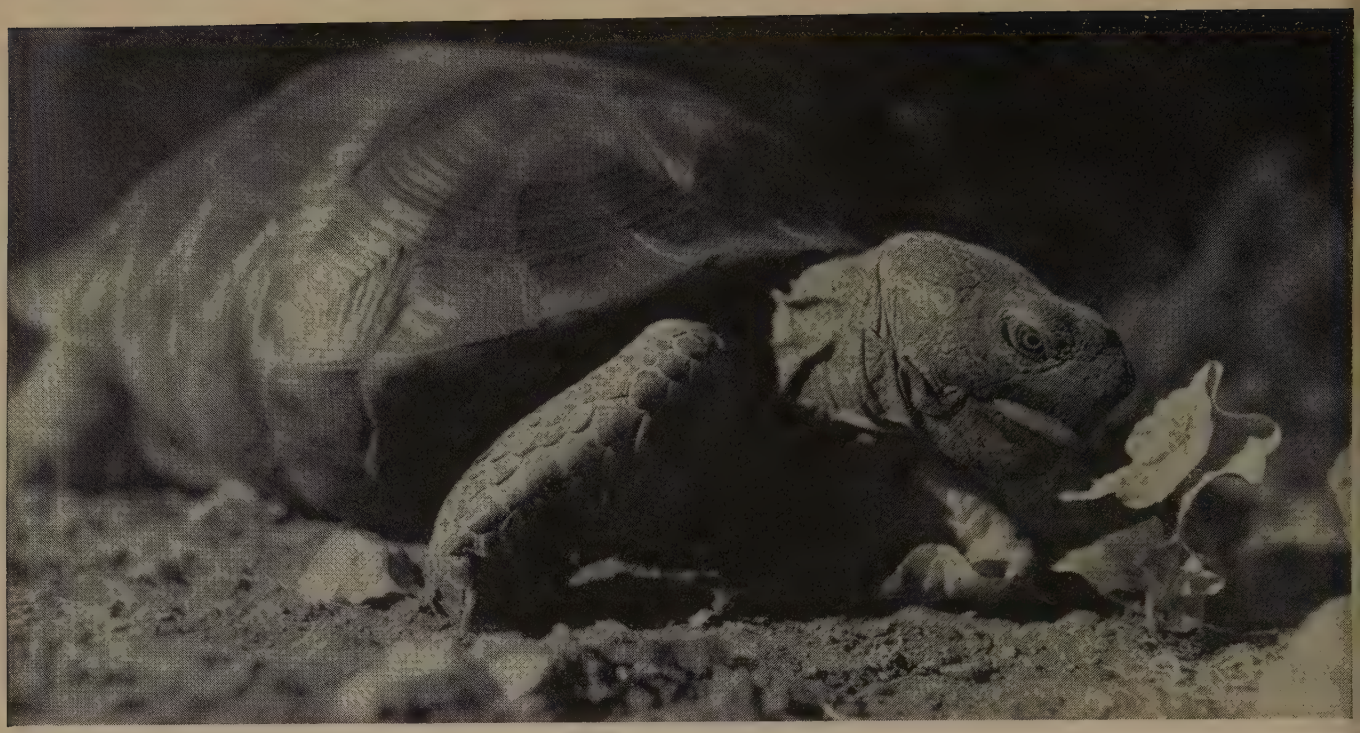
This last fact is a great disappointment to them. I rescued Chiquito—"Little One"—first. He is some nine inches lengthwise of his upper shell, without allowance for the curve, smaller by two inches than Viejecito. Without asking him, I judge by the ridges on his carapace shields he may be a young blade of thirty. Viejecito, whose name in Spanish conveys the sense of "Little Old Gentleman," is, by his aspect, of more venerable years.

Our moronic human race has the habit of carrying off these most gentle and unoffending of creatures from their natural habitat and then, when fancy strays to new Roman holidays, turning them adrift. When I took in my second mature waif, the first, Chiquito, was busy eating bean plants down my garden row. I set Viejecito-to-be at the head of the same row.

Almost instantly the two tortoises saw each other. Their mild eyes grew visibly bright with joy. They gazed with upraised heads. Then, with clumsy speed, walking in tortoise-style tiptoe on the front feet and elephant-wise on the back ones, they advanced each toward each. Nodding their heads emphatically and rapidly—nod, nod-nod; nod-nod, nod; nod, nod, nod—they kept this curtsying up in varying rhythm for some time, like two amiable Frenchmen meeting on a bridge. They touched noses; moved around each other inquiringly.

Then it was the cloud of shattered hope came over those appealing "mugs" of theirs. Alas, ye tortoise poets, what availeth spring?

In fact, however, desert tortoises of both sexes usually greet each other with a few bows. If both are males, sometimes they finish off the head-nodding with a ludicrous and perfectly harmless bumping bout. The two knights are so well encased in armor that neither can hurt the other, unless, perchance,



Note his tongue as Viejecito considers the toothsomeness of a young lettuce plant. Vegetarian tortoises, even of one species, show decided individual food preferences as to grasses, vegetables and fruits.

one is left on his back in the burning sun, when death can quickly result from exposure.

All true tortoises will manifest attachment to human friends. Mine *prefer* eating from my hand to feeding themselves. As long ago as 1908 the celebrated reptile authority, Ditmars, was already writing of the tortoises—and since corroborated—that he has found them the most intelligent and most docile of all reptiles. He adds that "even with the huge species from the Galapagos Islands, and their allies from the Aldabra Islands, which creatures have power enough in their great jaws to sever a man's hand at the wrist, we find the same docility, combined with an intellect that approaches the mental capacity of warm-blooded creatures."

C. H. Pope, author of the only American book on turtles, quotes scientific evidence, for the turtle tribe generally, of a color sense that is close to that of man himself; of an ability to learn, to discriminate, and to remember. Members of the order Chelonia, which includes turtles and tortoises, can distinguish between not only black and white, but red, yellow, blue, green, and violet; between variously lined patterns; between the various turnings in a maze. They can react with good sense to matters pertaining to food and safety. They can, with little loss, repeat acts they have learned, after a number of weeks. Their record matches that of many mammals.

A striking demonstration of a chelonian homing sense has come to me personally. The tortoise in question, a desert tortoise, resided in a garden at Del Rosa, California. The lady of the house was very fond of him, but the gentleman decided Mr. Tortoise's inroads among the plants were too pronounced. Accordingly, he took him, by car, a number of miles to a wild well-herbaged spot in the San Bernardino desert—*Gopherus agassizii's* natural home. He left him, and drove off. Not many days later, the couple were astonished and touched to find Mr. T. back in their garden, wearing the mild, forgiving tortoise smile.

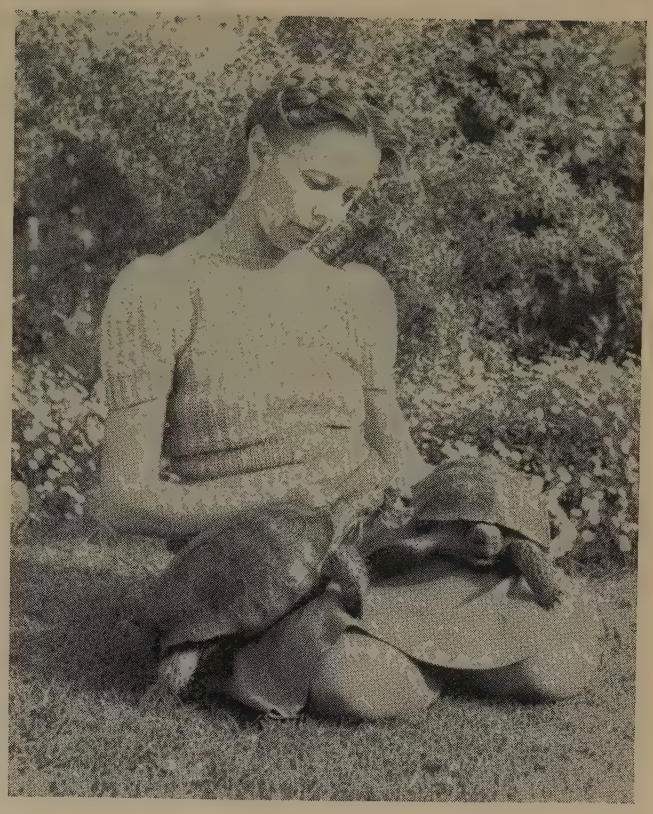
How did he find his way back? The mystery is as absolute as in similar cases involving cats and dogs. I can add that identification was absolute, as the tortoise had been given an identifying mark.

Another out-of-the-ordinary case for which I can also vouch concerns a number of desert tortoises and the caretaker of a mine near Ivanpah in the San Bernardino mountains. The tortoises, when they wandered in, were warmly welcomed as a break in a lonely existence. Gladly the caretaker indulged their feeding on the scanty herbage about his cabin and stroked their trustful heads to their sweet content. They stayed several weeks, and then, almost at once, were gone.

But joy cometh in the morning. Next year, at approximately the same date, they were back. They have returned thus year after year, staying always for a short summer period and disappearing for the rest of the months. There are perhaps five or six of them —each duly named.

A touch of Nature I cannot neglect mentioning is how the man ordered a "treat" for the tortoises. He resolved, so he tells it, to get them something really first-rate. He would get lettuce for them—a whole head each. What could be grander for vegetarians stranded like these in the sterile rocks?

And do not think his providing lettuce was like running down to the corner vegetable stand. On the



The author with Chiquito and Viejecito, both of whom show a marked preference for being fed from the hand instead of picking their own food.

contrary, it involved going all the way to Kelso, a town he visited only once in two weeks for his mail, to send the order, which went out by flagged train across the miles to Los Angeles. There it was filled, and, in due course, the lettuce came back, nicely crated and refrigerated.

And, lo and behold, the tortoises—nary a one—would touch it! They, simple desert denizens, knew not such luxuries of civilization. With most desert tortoises, however, lettuce actually is what it was expected to be in this case—a relished delicacy.

The genuine tortoise—the club-footed completely-terrestrial-in-structure land turtle, of the genus *Testudo,* or related genera—is, in all his many species over the earth, Patient Griselda and Mahatma Gandhi done up in one package. His sweetness of disposition, as well as his vegetarian habit (it is remarkable how much he can get down a day in the way of tender vegetables, fruit, grass, clover, and other fresh green fodder), make him a shelly embodiment of the Eastern doctrine of Ahimsa—harmlessness to all living creatures.

There is a fascination in checking how his character everywhere tallies. Whether he is an American desert or gopher tortoise; or the ordinary European tortoise often found as a garden pet, such as Gilbert White depicts, in *The Old Family Tortoise,* as showing such touching devotion to the old lady who had befriended him in contrast to docile indifference to other folk; or the big or small Galapagos Islands tortoises, like Dunc, Rosie, Shoe Shine, and the others described so agreeably by Gifford Pinchot in his beguiling *To the South Seas*—always he is the same inoffensive, confiding chap.

To know a tortoise is to appreciate the Chinese judgment of them. The tortoise, says the Chinese Book of Rites, is one of the four spiritually endowed creatures. He is the symbol of longevity, endurance, and perfect righteousness. When P'an Ku chiselled out the universe, taking 18,000 years in the task, the tortoise was ever close beside him, and became with him one of the progenitors of the animal creation. And the tortoise family, according to all Chinese sacred lore, has been bestowing blessings on Celestial mankind ever since.

The Chinese put the age-span of the tortoise at a really impressive figure—anywhere from a thousand to several thousand years. But science is agreed that the chelonian—even if he has no birth certificates to prove he quite equals that record!—is nonetheless the longest lived of all vertebrates, not excluding man. The authoritative Mitchell, late secretary of the London Zoological Society, put it thus for an encyclopedia article on longevity: "There are records of small land tortoises that have been kept in captivity for over a century, whilst the very large tortoises of the Galapagos Islands certainly attain ages of at least two centuries and possibly much more."

The giant tortoise who knew Napoleon is, I believe, still living at St. Helena, whither he was brought from Aldabra. Napoleon died in 1821. Figure it out for yourself! The equally celebrated giant tortoise whose honor it was to be specifically mentioned in the treaty by which, in 1814, the French ceded the island of Mauritius to England, met an accidental death in 1918. He had 175 years of known and dated "grown-up" history behind him.

Two hundred and twenty years was—perhaps on insufficient grounds—adjudged the achievement of the chelonian of fame named "The Peterborough Tortoise." The record of his last century of life, including the names and tenures of office of the seven bishops he outlasted, is preserved at the episcopal palace in Peterborough, England. While the seven bishops lived and died in the palace, the venerable tortoise, another of the mammoths in size, went peacefully about the garden, burying himself in winter, making friends with the gardeners in summer, and gobbling down, on occasion, a whole pint of gooseberries at one time. Nor was he slow, the record implies, about strawberries. In fact, His Grace, the Bishop, we gather, might have gone berryless had it depended on His Lordship the Tortoise. The big fellow might have murmured to himself:

—Men may come and men may go,
But I go on forever.

But this was not quite true. At last—after that brief 220 years, it may be—he gently took his final sleep.

An inspired high school instructor with his feet on the ground shows how to recruit—

Students of Natural Wonders

By HOWARD ZAHNISER

MY FACE should be *red.*

Twenty years ago I went from the rather wild, wooded hills of the Allegheny River valley to attend college in Greenville, Illinois—"in the midst of rolling prairies," as the school song went. Some six years I stayed there as college student and high school instructor, and for six years I was homesick for the "natural" surroundings of my wild Pennsylvania hills and valleys. I did write some verses about—

> My meadow larks sing sweeter notes
> Than tropic birds with gayer coats.

I wandered the town's streets in awe on a thick foggy night when migrating geese circled overhead, noisily lost. I roamed the gullies for outdoor exercise and sat under a certain sycamore tree at the toe of a slope trying to imagine I was back among the hills. During my high school classes I talked about Wordsworth and Keats and Bryant, but I am afraid that all the love of Nature I inspired—if any—was in literature. No one could have persuaded me that Greenville was a place to study Nature.

A decade later, passing through Greenville on a field trip for the U. S. Biological Survey, I talked to Gib Mouser's high school biology class, because Gib —a student when I was a teacher—paid me the compliment of an invitation. I spoke, as I recall, about the citizenship requirements for an interest in conservation and the inspiration there is in all the manifestations of life. It never occurred to me I could be encouraging a group of local naturalists. I missed the opportunity entirely, for I still had not associated a plain Illinois community with naturalists.

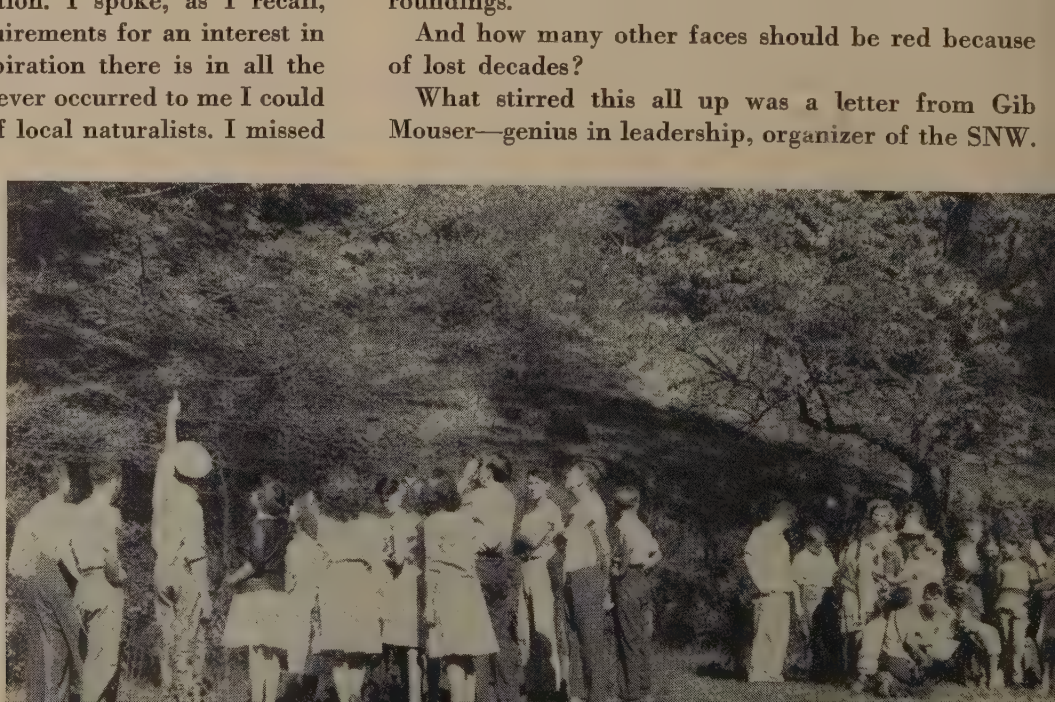
Today you can see high school students in Greenville wearing the badges of naturalists. Today there is a naturalists' club in Greenville High School.

Students of Natural Wonders they call themselves, but they also make their initials mean Save Nature's Wealth. The forty members have made a local reputation for themselves. A teacher reports that fifty volumes on Nature subjects have been purchased in a season by club members through the school. Mrs. Martha J. Pulis, the English instructor—my successor—says she wondered what caused the members "to get up at all hours of the morning to go on hikes to see stars, birds, tracks, or what not," what caused them to "spend extra time in the science room where the SNW met." She went to club meetings out of curiosity, stayed because she too became interested, and later brought her daughters also. The answer to her first wondering, she concluded, was the young naturalists' "interest and desire to know the answers to their surroundings, whether it be on the ground, in the ground, or above the ground."

With all my interest in the outdoors, with all my zeal for conservation, what an opportunity I missed because I did not sense what Martha Pulis thus calls "the interest and desire to know the answers to surroundings."

And how many other faces should be red because of lost decades?

What stirred this all up was a letter from Gib Mouser—genius in leadership, organizer of the SNW.



One group of members of the SNW has spotted some elusive bird in a tree, while another group has come upon something else of interest, all on a field trip.

PLEDGE

"I, _____, agree to forego any previous pleasures I have thought I found in killing various forms of wild life. In fulfillment of my part of the agreement, I promise on my honor to refrain from shooting or otherwise killing all types of wild life for a period of not less than four years.

"I understand that the game listed below are not necessarily included in the above agreement.

"1. Cottontail rabbits, if used for food.

"2. Fish which come under the game laws."

"Possibly you remember," he writes, "when you visited one of my classes and made us a very interesting talk. I am afraid at that time we were babes and were unable to grasp the entire spirit of your message. Probably the fact that we were teaching a more or less strict type of science course had much to do with the fact that we were unready to appreciate fully the various aspects of conservation brought out in your talk."

Without intention, with all kindness (perhaps with admiration), what an indictment Gib thus wrote of that talk and (for some consolation) perhaps also of his own science course. As for its effect on me, my question is: "Just who was the babe in that biology classroom?"

Gib's letter with its enclosures throws some further light on the question, and if the listeners were the babes, certainly out of their mouths—and actions—has come considerable wisdom.

"As a boy of high school age I worked as you know in a grocery store," writes Gib. "Ebe, the manager, was always a few steps ahead in matters of merchandising. Well do I remember one of his plans in introducing new merchandise. He would say, 'Boys, I want a big display right in front of the door so people will have to walk around it. Build it so they can pick up a can for themselves.' But Ebe didn't stop there. He carried a sample with him. All day long the product was within reach so that he might literally lay it in the hands of that customer who lacked the initiative to reach out and pick up a can for himself.

"Did it work?

"Our bunch would answer, 'Are you kidding?' "

"Key teaching," Gib continues, "aims to parallel merchandising at its best. Accordingly, in as subtle a way as possible, we have set out (1) to sell our group on the need of Nature knowledge, (2) to hold this interest after we have it, and (3) to establish and constantly improve a program of activity which will lead one on until it has him doing things on his own."

Does it work?

We know already what Gib's bunch would say, and there is evidence besides such testimony.

Gib's enclosures include a series of compositions by club members of which he is personally proud (at least in correspondence with me), and rightly so, too. "We feel," says Professor Gib, "that the youngsters have done a good job, and I can assure you that their statements are accurate."

Alice Koonce writes about Aims of Our Club—"to be able to call our Nature friends by name," . . . "building clear cut plans for future use of leisure time," . . . "become accurate observers and recorders," . . . "be good leaders, and to be good leaders we must be accurate describers and good listeners."

Mary Lamson explains Club Organization and Function—"essentially simple, . . . sufficient organization to keep things running smoothly and efficiently and to encourage student participation and expression." The Club's awards speak for themselves, says Mary—"field guides such as Peterson's bird guide, Lutz's insect guides, Mathews's trees and shrubs, or supplies for club work."

Greenville's city park offers a rich variety of handy Nature experiences for the inquiring young naturalists, while State parks not too far distant are also visited by SNW.

The SNW maintains a Nature library of books and magazines and we find it difficult to quarrel with the choice of the magazine currently being considered here.

William Lehn tells of the club program and, of equal interest, how it came about. He writes, in part, as follows:

"'Would you like to be able to greet Mother Nature's children by name when and where you meet them?' This challenge, presented by our counsellor, Mr. Mouser, was accepted by a dozen students and was the beginning of our SNW Club. As a charter member, I have seen this club grow. In all its growth our efforts were then and are now centered on knowing Nature.

"It falls to my lot to outline the program around which all our activity is built. Briefly our learning is based on unit achievements, 35 in all. To earn the much coveted S. N. W. Naturalist title and the sterling silver key, we must have satisfactorily completed 25 specified units."

Thus members themselves write of their club. Most interesting, however, of all Gib's enclosures with enthusiasm ("I felt," he says, "that you would be interested to know that we are up and coming along this line.") is the club's activity guide, which he and the Club's co-counsellor, Miss Margareteva Simmons, have prepared, with acknowledgments to the Rev. George M. Link for ideas borrowed from Father Link's work with the Springfield (Ill.) Nature League. This guide is an outline of the club's activities—in 35 units, as William Lehn pointed out. Each unit has its designation—Study Corner, Fireside Saunters, On the Trail, An Attractive Character, Jes' Fishin', SNW Digs In, SNW Sees Stars, and so on—and each unit has its definite requirements of things to be done in fulfilling its concrete aim—such aims as:

To establish efficient study habits.

To be interesting naturalists; to be able to guide others to good Nature books and articles.

To become at home out of doors.

To become systematic, accurate recorders.

To be worthy of the name naturalist.

To know our insects, both friends and foes.

Not to be suckers; to know as much about fishes as the guy who tells the story.

Of peculiar interest is Unit XXXIV, which is quoted in full at the top of page 23. Any candidate who signs this pledge may substitute this agreement for any unit selected by the counsellors.

Mary Lamson tells how the club functions in carrying out this program.

"Regular instructional meetings," she explains, "are held once a week on Wednesday night from 7.30 to 9, and at this meeting special topics are considered in one of the following ways: counsellor talks, movies, slides, etc. All work, of course, centers around our Study Unit Plan. Special project nights, bird feeders, plaster track making, and the like are worked in also.

"In addition to our regular club meetings we present a varied number of public programs during the year. For at least one meeting a year we attempt to present some guest scientist of note. Proceeds from these programs are used to further club activity.

"Local activity is supplemented with trips to zoos, museums, botanical gardens, and other such places. All of us look forward to a spring and fall trip to Pere Marquette State Park."

It is my suspicion that what G. W. Mouser and the students of Greenville (Ill.) High School have done in Nature education can be a model for a thousand other high school instructors and their schools.

An example of its concrete results is told by Miss Simmons, co-counsellor and general science teacher:

"The SNW," she writes, "had a star hike a week ago and saw the visible planets in the forenight, through the telescope. During this hike, a student guide pointed out 20 constellations, their component star parts, and magnitudes. Interest was high, and this hike was discussed in classes the next day. Not long after that, one of the members early one morning reported to a counsellor that he noticed on the way to school that morning that Jupiter was 'actin' funny,' and sure enough, the evening papers carried an item about the eclipse of Jupiter."

The eyes of SNW may at times be on the stars, but it seems to me that their feet are pretty solidly on the ground. The influence of such educational activities on the national conservation (Continued on page 52)

An assemblage—or, perhaps, we should say herd—of seahorses in a coral setting. This picture shows their upright posture when swimming. The dorsal fin, which serves as the little animal's propeller, is to be seen plainly on the fish in the center.

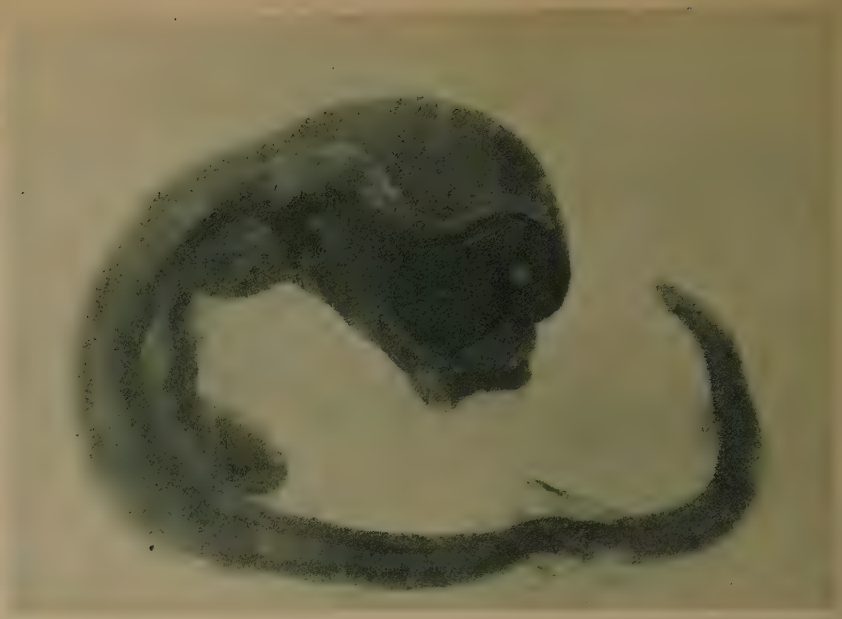
Seahorse—Fish, Not Filly

Photographs by Lilo Hess

The seahorse, *Hippocampus*, includes a large number of species, very much alike structurally and differing from all other groups in possessing a prehensile tail, and lacking a caudal fin. The head and body are protected by rings of bony plates. The head, which superficially is remarkably like that of a horse, is supported at right angles to the body on what appears to be a short neck, but which in reality is the "forepart of the abdomen, there being no true neck in the fish", as Dr. Theodore Gill remarked many years ago. Apparently it is this "distortion" that has taken place in the evolution of the fish that has resulted in the pectoral fins seeming to be attached to the head. The small mouth is toothless, and the food consists principally of tiny water animals, including minute crustaceans, these being sucked through the tube-like snout. The seahorse, when swimming, generally holds the body perpendicularly, and progresses by rapid movements of the small pectorals and the dorsal fin, which vibrate in harmony. The fish moves rather slowly, and often rests, usually in an upright position, clasping the tip of the tail around the stem of seaweeds or other floating plants.

Perhaps the most interesting characteristic of the seahorse is its manner of reproduction. The male has a small brood-pouch on its belly at the base of the tail, and there the eggs are deposited by the female, by means of seasonal development that provides her with an organ that is in effect an ovipositor. She places the eggs a few at a time, and it is assumed that fertilization takes place at this time. The male may be visited by several females, until his pouch has become distended from its burden. Here the eggs hatch after a short period of incubation. The newly hatched young,

On this and the facing page we see some intimate glimpses of the life of the seahorse. Opposite is recorded a moment in the courtship of the fishes. This is quite an elaborate ceremony, the pair circling each other in the water, swimming gracefully around and around. The wooing soon nears its climax and the male and female fishes approach one another. The female transfers her eggs into the pouch of the male, and they are believed to be fertilized at this time. They remain in the pouch for about forty-five days. Lower right is a male with a pouch swollen by prospective small seahorses. One can almost imagine an unhappy look on the paternal face. Above, on this page, the male fish bumps his distended pouch on a shell, possibly with a desire to hasten the day of the ejection of the little ones. Below, through the X-ray, we see the exterior and interior skeleton of the seahorse and the shadowy pouch, and, finally, a tiny new seahorse wriggling out of its father's pouch. The young are miniatures of the adults and soon are on their own, instinctively attaching themselves to something and starting to feed. More than one female may deposit her eggs in the pouch of a single male.



Eggs of the seahorse, much enlarged, just before they are ready to hatch, and right, above, an embryo of the little fish, still more enlarged. At the left is a seahorse baby ready to hatch and already taking on recognizable form.

which are nourished to some extent by the thickened and vascular lining of the pouch, are precisely like the parents except in size. At the proper time the young, now able to seek their own food, are ejected from the pouch, and soon learn to attach themselves to the nearest seaweed, or other convenient resting place. From their habitat, some species have developed protective colors, and, in the case of a few, leaflike structures on various parts of the body, so that they are practically invisible among the waving tangles of water plants. Such a one is the so-called sea-dragon of Australia, *Phylloptery eques*, in which the camouflaging has developed to an almost unbelievable protective display.

Besides *Hippocampus hudsonicus*, which is found along our coast from the Chesapeake Bay to Cape Cod, there are others about Florida and the Gulf Coast, and about the West Indies and Central America in both oceans, as well as on our Pacific Coast. The Indian Ocean has its share of species, and the region of the Mediterranean, also. Roughly, the seahorse inhabits the warmer parts of all oceans around the world.

While most of the facts relative to the life history of the seahorse have come as the result of investigations of modern times, it is natural that a fish so queerly constructed should have attracted the attention of those interested in natural history in very early times. Early authors did not let their ignorance of facts interfere with their narratives. Thus there grew up many misconceptions and superstitions about the supposed efficacy of the fish in the cure of certain diseases in man, some of which apparently still persist among the ignorant and credulous. Greek and Latin writers of the first to third centuries are quoted as believing that the ashes of seahorses, presumably dried ones, administered in wine, would eventually result in death. If the ashes were mixed with oil of marjoram or pitch, and rubbed on, baldness might be cured, or if mixed with water they would cure canker or leprosy, or the result of the bites of a mad dog. Dried seahorses have lately been reported as still available in the Chinese drug stores of San Francisco.

Egrets on the Wing

Photographs by Hugo H. Schroder

An American egret, *Casmerodius egretta,* exhibits the rounded sweep of wings and tail as the bird takes flight. Note the spread of the slotted wing tips on the right wing. The trailing wings extend far beyond the tail feathers, reaching to the ends of the bird's toes. Below, we see the graceful take-off. Note the spreading tail and the wisp of plumes projecting beyond the tail. The unusual wing position accents the slotted feathers at the wing tips.

The American egret is the largest of our white herons or egrets, all of which are beautiful. It was originally distributed, in suitable breeding places, marshes or wooded swamps, from southern Canada to Patagonia. It is now rare, and confined in North America, to the East and South, and, possibly, in parts of California and Oregon.

To many bird lovers, the mere word egret brings to mind the days when these lovely birds were almost exterminated in our southern states by the rage for aigrettes, the beautiful filmy plumes that form a part of the scapulars of both sexes during the breeding season; other smaller egrets were similarly adorned and also suffered near-extermination. The aigrettes sold for more than their weight in gold.

It is worth recalling these days and we may do so through the following account, written in 1923, by the late James Henry Rice, Jr., of South Carolina. Mr. Rice had been a hunter (although never a plume hunter) and was appointed by the National Association of Audubon Societies for the field investigation, because of his knowledge of the birds and their haunts. He wrote:

"The plumes are the nuptial feathers of the birds, at their best in the nesting season. Soon after nesting has been finished the plumes are shed, being frayed and worn then, useless for trade purposes. Hence birds were shot on the nest, often

At the top, left, is an egret in flight, the pose showing the normal flight, with legs fully extended and the head drawn back, while the neck is in a big S-curve. Top, right, the bird is in straightaway flight with the neck in the characteristic curved position, legs held straight and toes closed together Above, the bird is seen on the down stroke, the feather pattern nicely displayed in the extended wing. At the right, the egret is making a quick turn, wings far forward and, together with the tail, they form an almost continuous pattern.

Egret, left, in typical flight but with feet dropping for a landing. The wings are practically at their full spread. The bird below is dropping to land. The head is forward to serve as a balance. Wings are held high. The toes have not yet touched the twig but the alula, or thumb, shows plainly. At the bottom of the page the bird has just landed in the tree-top. One foot is visible above the foliage, wings are held up, the tail is spread and the bill is open. Note the trailing plumes in a fine display, extending far beyond the tail.

with 22-caliber rifles, and the plumes cut away. Living birds have been captured, the plumes torn off and the birds left to die lingering deaths. The young in the nests starved . . .

"The larger American egret nested in tall trees, but they were shot all the same and many killed while feeding on the marshes, the birds being drawn by decoys. . . .

"The same destruction raged along the Gulf coast, as far south as Mexico; it was just as bad on the Pacific, where Klamath Lake in Oregon was the scene of bird slaughter equal to any in America.

"This same slaughter raged on the islands of the sea. Egrets were shot by hundreds of thousands in

Venezuela. . . .

"Heron feathers were worth eighty dollars an ounce, four times as much as gold; . . . Before such a ravening lust, the bird was doomed." . . .

"The man who woke the world's conscience was William Dutcher. In all movements for saving birds, he was foremost. Patient, wise, untiring, a fine handler of men, Dutcher kept working, writing, speaking and biding his time . . .

"He crossed the seas and enlisted the cooperation of foreign countries. It was he who brought the great nations of Europe to see the world's danger. Wherever in the world bird slaughter went on, Dutcher was sure to reveal it and to cry aloud for its suppression. He seldom cried in vain."

North American Marten

By EDWARD A. PREBLE

Photographs by Leo Jobin

The marten of North America is the New World representative of the famed sable of Eurasia, which has long been considered one of the most beautiful and valuable of fur-bearing mammals. Formerly it was excessively abundant over all of wooded Canada and Alaska, and its range extended southward into our northernmost states, mainly in the coniferous forests, and farther in the Alleganies, Rockies, Sierras and Cascades, to Virginia, New Mexico, middle Oregon and California.

The marten's food consists of small rodents, including a great variety of native mice, rats, squirrels and ground squirrels, as well as what birds it can manage to capture. It also eats crickets and other insects, and berries and other small fruits.

During the exploration and settlement of our West, and also of Canada, the marten was one of the more valuable of the furs that encouraged the hunter and trapper to penetrate the wilderness. Many a pioneer among the thousands of those who built up our great West was able to get his start from the proceeds of his trap-line.

In Canada the Hudson's Bay Company, a fur-trading organization founded in 1670, paved the way for the future settlement of that great wilderness. So powerful did this company become that until about 1869 the main governing power of the vast area was in its hands. During the long period of its regime, its influence over the native peoples was well-nigh all-powerful. The trapping grounds of each native family was sacred by mutual consent, and as these were considered hereditary, it was to the interest of all to keep the breeding stock of fur animals in such condition that the coming generation should not suffer. Precautions were taken that no skins were taken until they were in prime condition, and that trapping cease early enough in spring to provide sanctuary during the breeding season. The traders brought to the natives whatever they needed for their wilderness life, and all were happy. It was to the interest of both traders and natives that inter-tribal quarrels were kept to a minimum. But policies changed. The government feared that the company was becoming too powerful. Other trading companies were formed, and soon trapping was opened to all. The new-comers did not respect the immemorial unwritten titles to the hereditary breeding grounds, the country was over trapped and the pursuit of furs became a mad rush o competition. Not one marten now survives where score formerly existed, and the vast realm is no longer calle the "Fur Countries"

Small Wildlife Sanctuaries

FROM time to time we have printed in these pages articles about small wildlife sanctuaries established by individuals and by groups. We hope to print more, because we believe that such havens, ranging in size from a few acres to several hundred acres, are important to the future of our wildlife, and valuable as symbols of wildlife protection.

In this country we have, of course, a fine system of large wildlife refuges maintained by the Fish and Wildlife Service. This should be, and doubtless will be, expanded in the future. However, these areas are not all predominately sanctuaries in object and in fact. They have been established primarily to provide nesting, resting and wintering places for migratory game birds. Since they provide these birds natural habitat they also, incidentally, provide haven for non-game species. Nevertheless, some of these areas include shooting grounds during open seasons, and almost all of them may be considered as natural factories for the production of more birds for the sportsman. As such they are not properly described as sanctuaries.

Thanks to the Audubon Society we have, in the South, a number of splendid sanctuaries set aside to protect endangered bird species. These are inviolate refuges, and without them the list of extinct American birds might soon be longer than it is.

In addition, our National Parks offer sanctuary to all forms of wildlife, save occasionally where the numbers of certain species increase beyond the ability of the area to support them. Then a balance is achieved by scientific reduction of the over-supply. Most of the parks in the state park systems are likewise wildlife sanctuaries.

There the extension of complete protection of wildlife ends, except as is offered by protective laws that are none too well observed or enforced.

Interested in Nature for Nature itself, animated by a desire to study Nature under natural conditions, or inspired by a desire to protect wildlife, many individuals and groups have sought to surround property that they own with protection. In so doing they have encountered almost complete lack of interest and cooperation on the part of state and local governments. Indeed, more often than not, they have been discouraged by the authorities, who point out that there is nothing in the law that allows them to aid the property owner, except for the laws about trespass.

Of course, the reason for this attitude is not difficult to understand. Sanctuary-minded people naturally turn to the state conservation commission or fish and game department. These agencies are supported from funds derived from the sale of hunting and fishing licenses. To encourage setting aside areas on which animals could not be hunted or caught might easily, if the idea became popular, dry up their source of income—and their jobs. So the person desiring sanctuary status for his property must act as his own warden—perhaps at the risk of his life—post his property against trespass and try to make it stick. More often than not it does not stick, and the owners become discouraged and abandon their original idea.

Michigan, for example, enacted a "Wildlife Sanctuary Law" in 1929. Under it any property owner may dedicate his property to the State of Michigan for the purposes of a wildlife sanctuary. This is not a deed or lease, but is intended to permit conservation officers "to cooperate to a reasonable extent in the apprehension and conviction of violators. Fishing rights are not included and the old civil trespass law is the only protection against unwelcome anglers."

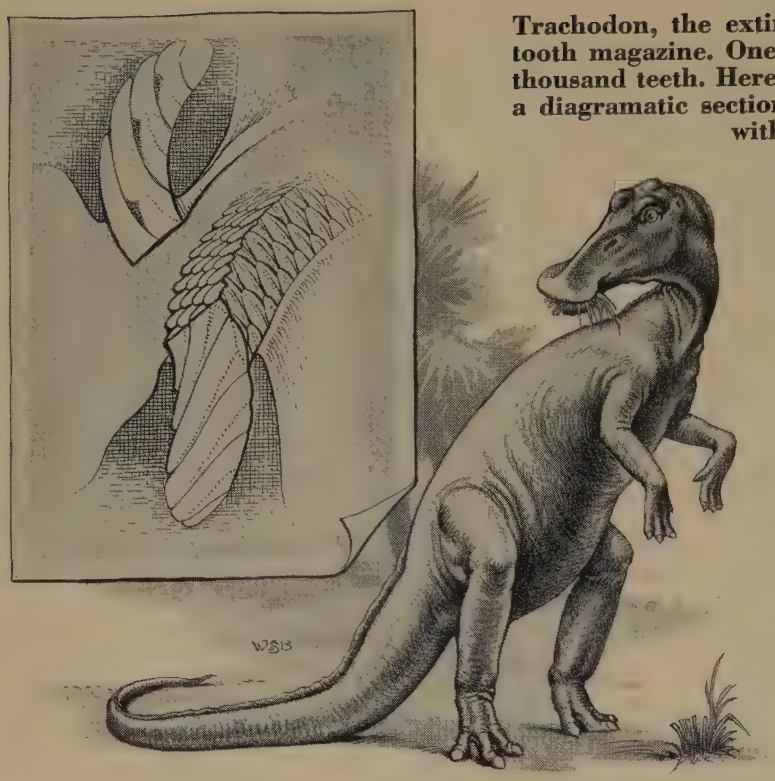
The Michigan Conservation Department frankly states in its announced policy with respect to the law that it is not sought to provide "police protection" from careless or irresponsible hunters. In fact the Department "endeavors to avoid the use of the law for the purpose of protecting private property from trespassers." With equal and commendable frankness, the Department adds:

"The administration of sanctuaries dedicated under this law is financed from the Game Protection Fund which is derived largely from hunters' license money. It is therefore logical that in considering such areas for dedication, the Department should keep the interests of the hunter primarily in mind. Use of the sanctuary law is restricted as much as possible to the protection of shootable game in localities where the hunter will have some opportunity to harvest the wildlife increases resulting from this protection."

In other words it is hardly a sanctuary law. Yet, at that, Michigan is ahead of most states. Others ignore appeals for aid in establishing sanctuaries, definitely discourage them, or try to divert the landowner into a farmer-sportsman relationship under which, for certain considerations, his land may be shot over in season.

Through the years we have received many requests from individuals wishing to set aside a woodland or other property as a wildlife haven. They have asked how they can do it. Usually the only answer that can be given is that they can post signs—later, perhaps, to be pulled down or shot down by irate hunters—and try to keep trespassers out. They can expect no cooperation from the fish and game authorities. The more intrepid do the best they can as individuals; others are discouraged.

Manifestly what is needed is the enactment of state laws permitting the creation of wildlife sanctuaries and extending to the landowner cooperation in maintaining them as such. Enactment of such laws faces difficult but not insuperable obstacles. We urge, as a first step, that individuals get, in writing, from their state authorities exactly their attitude on a specific sanctuary project, and then start out to remedy the situation. And we would be much interested to learn of the results that they are able to obtain in this way.



Trachodon, the extinct duckbill dinosaur, was provided with a tooth magazine. One fossilized specimen boasted more than two thousand teeth. Here is how duckbill looked, and the inset shows a diagramatic section of the right jaw and the growth of teeth with mosaic grinding surface.

Some Toothy Tricks of Nature

By JOHN Y. BEATY

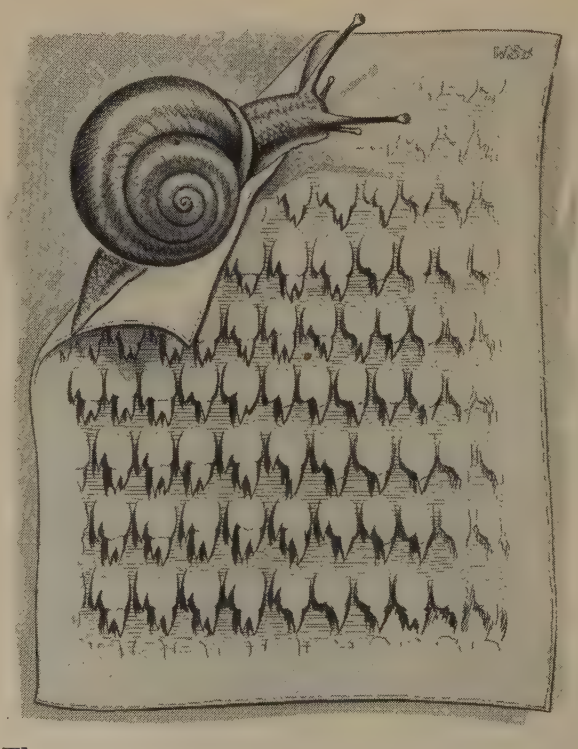
Illustrated by Wilfrid S. Bronson

Not all animals with teeth have jaws. There are a number whose teeth are on their tongues, and in many cases the number of teeth is astonishingly large. For example, the lampreys, instead of jaws, have mouths like funnels; the tongue, which is armored with many rows of sharp teeth, works in and out of this funnel-shaped mouth like a file. The lamprey eats the flesh of other fish, and it rasps away the scales and the flesh with this file-like tongue.

The hagfish is somewhat similar to the lamprey, and also uses a tongue covered with teeth to bore into the bodies of other fishes. Both of these animals have the shape and appearance of eels.

It is not usual to think of a shell having teeth, but the large shells found in our warmer seas and known as "whelks" have about one hundred rows of thirteen teeth each on their tongues. With this tooth equipment the whelk rasps holes through the shells of other mollusks in order to get the tender flesh that is inside.

The tiny shelled animal called "limpet," although often measuring less than an inch long, has a tongue containing one hundred sixty rows of teeth with twelve teeth in a row, 1920 teeth in all, with which it scrapes off portions of seaweed for food. The limpet has only one shell. It fastens its soft body to a stone so tightly that it is difficult to scrape away the shell while the mollusk is alive. The shell is shaped something like a tiny volcano, and some species have openings where the crater of the volcano would be—if it were a volcano.



The common garden snail and detail of its tooth-coated tongue. These tiny teeth are numbered by the thousands.

The championship for having the largest number of teeth on a tongue goes to an animal that may be found in your own garden. It is the ordinary garden snail. Some scientists who have examined the tooth-coated tongue of the snail say that there are "several thousand" teeth. Others say there are "countless thousands." Obviously, these teeth are very tiny. They are used to rasp away portions of the plant on which the snail feeds.

Probably the largest mammal that has been noted for a tremendous number of teeth is the long extinct duckbill dinosaur known as *Trachodon.* Its teeth were not precisely on a tongue, but in what is called a tooth magazine. More than two thousand teeth have been counted in

Sperm whale, narwhal and white shark have a varied dental equipment. The ivory teeth of the whale are many, large and heavy. The narwhal has only one tooth, as much as nine feet long. The shark has several rows of teeth and a reserve to replace those that have been worn out.

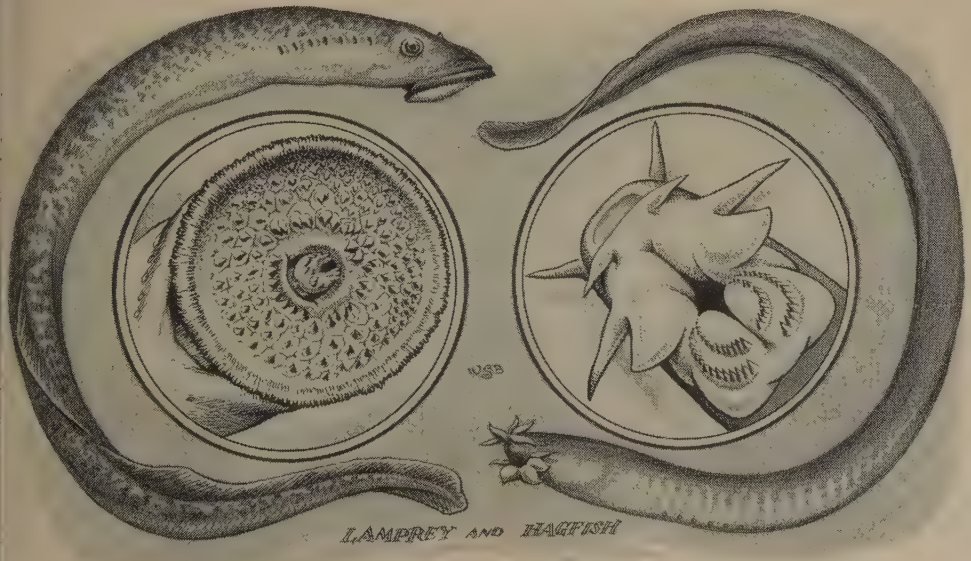
the fossilized remains of one trachodon. Not all of these teeth were used at one time, as is the case with the snail, but many of them served as spares and were used to replace other teeth as they were worn away.

If one examines the mouth of a shark, it will be noted that it has several rows of teeth, one of which will move into place to take up the work of another one that has been worn away or torn out. Many of the teeth of modern sharks are not more than an inch across. They are triangular in shape and are about as long as they are broad.

I have the tooth of a fossilized shark, however, that lived no one knows how many millions of years ago. The Academy of Sciences of Philadelphia has estimated that the shark that bore this tooth lived 80,000,000 years ago. The tooth measures three and one-half inches in each direction. That is, it is an equilateral triangle measuring three and one-half inches at the base, and three and one-half inches from the apex to the base. It must have been a tremendously large shark that bore a quantity of teeth of this size.

This tooth, however, is not nearly as large as the teeth of the sperm whale, which still exists. These teeth are ivory and are all sharp pointed and round. I have held in my hand one that weighed three pounds. A sperm whale has fifty or more of these teeth, on its lower jaw only. They are set two or three inches apart on the jaw and are used only for tearing the flesh of the whale's food into pieces small enough to be swallowed. The whale has no masticating teeth.

This might be thought to be the largest tooth of any animal, but investigation shows that there is another animal with only one tooth, which may be as long as nine feet. This is the narwhal, a small northern whale. The long tusk grows only on the male, is of ivory and twisted in a spiral, in corkscrew fashion.



The lamprey and hagfish are eel-like animals with tooth equipment in their tongues. This is used in a file-like manner to rasp at the flesh of their prey. Here we see these two fish with detail of their peculiar tooth arrangement, which would be a dentist's nightmare.

Junior *Xantusia vigilis* and three grown-ups of his species pose in proximity to a ruler, thus indicating the size of this tiny saurian of the Southwest. Photograph by Harry Pletcher.

Lizard Lilliputian

By GEORGE H. HANLEY

At NIGHTFALL, from his house of stone, creeps a dragon-like beast. His bedfellows, winged foragers of the dark, and venomous armored creatures, start their roving at the same time. The dragon's forked tongue flicks before him, his cat-like eyes watching for prey.

This is a picture of the desert or yucca night lizard, *Xantusia vigilis,* of California. But it is a worm's-eye view, for he is one of the smallest, most interesting and least known of our sauria. His companions of his home of stone, and of the night, are the least brown bat, scorpion and centipede.

The setting of the scene is Granite Station, an old stage stop of early gold-mining days, on the route between the Kern River gold fields and the Great Valley of California. One family in residence prevents the spot from being just another ghost-town relic.

The foothills around this place are covered with dry grass and large granite boulders. Only in the early spring could this land be called beautiful. Then wild flowers hold sway in rippling color on the hillsides. The boulders shelter these tiny lizards. The alternate heating and cooling of the surface of the rocks causes thin layers to flake off in large slabs, called cap-rocks. These remain in place, affording snug, dry hide-outs for tiny creatures. When the sun shines, the flakes are thin enough to be warmed through to the little day-sleepers' bedrooms. There, through the day, the lizard lies, looking out, eyes never closed, for they are lidless, a characteristic rare in lizards.

Like some other night prowlers, the desert night lizard has a vertical, slit-like eye pupil, more adaptable to darkness than are round pupils. Small insects creeping under the cap-rocks are devoured. Insect and spider eggs are sought out, indicating that smell is used as well as sight in foraging.

When hunting the tiny animals, I carry a crowbar or miner's pick, which greatly assists in prying away the rock flakes. The surprised creatures are usually too startled at first to run, although once accustomed to the light they prove that they are nimble.

Often, under the same slabs, the least brown bat is found, a tiny creature that shares honors with the shrew as the lightweight of the mammal world. There, also, reside scorpions and centipedes, any one of which would dwarf our little lizard. Found often around the same boulders is a dainty little snake, the spotted night snake, *Hypsiglena ochrorhyncha.* It is too small to eat much except insects or immature lizards. Young night lizards may well be an important item in its diet.

There are five species of *Xantusias* in North America. All of them are found in the Southwest, usually under cap-rocks. Normally, however, our little *vigilis* differs from the rest. He would rather live under the decaying branches of Joshua trees and other yuccas, when they are available. Lacking these, the lizard reverts to the stone homes of his kind. This has happened at Granite Station.

Xantusia night lizards are a primitive group. They are ovoviviparous, giving birth to only one or two young at a time. Their closest relatives are the skinks and the whip-tailed lizards. Only the geckos, of all our lizards, are farther down the scale of evolution.

As the four-score mark nears, Edwin Lincoln Moseley, pioneer teacher of the natural sciences, carries on in his laboratory at Bowling Green State University, Ohio. He is now working on long-range weather forecasting through tree ring study.

Edwin Lincoln Moseley

The Biography of an Educator

By JOSEPHINE TRUE

In Ripley's "Believe It Or Not," a few years ago, there appeared a sketch of Dr. Edwin Lincoln Moseley, one of Ohio's patriarchs of natural science, with the statement that he had taught school for forty-eight years without missing a class. The 79-year-old professor who established this outstanding record is now Professor Emeritus of Biology and Curator of the Museum of Natural History at Bowling Green State University, one of Ohio's five state universities. Dr. Moseley pioneered in the teaching of natural science by the experimental method. During twenty-five years at Sandusky, Ohio, High School, followed by twenty-two years at the Ohio university, he has taught some form of natural science to more than six thousand young men and women.

Professor Moseley is more than a teacher. He is a practical scientist, and only recently have some of the significant contributions of his painstaking and continuous research become fully apparent. As a young high school teacher of twenty-two, Edwin Moseley began a program of research that he has followed conscientiously to the present. Early in his teaching career he applied the stimulus of these practical scientific problems to the classroom, and encouraged his students to join him in research.

Although nearly eighty, Dr. Moseley continues his work with characteristic vigor. In recent years he has devoted much time to perfecting theories of long-range weather forecasting by means of tree rings. Daily he can be found in his campus laboratory, or working with his extensive museum collection. He has become one of the inspiring figures on the Bowling Green campus—a slight, erect old gentleman with a white beard, an absorbed manner, and intense, observing eyes.

Edwin Lincoln Moseley was born in Union City, Michigan, on March 29, 1865. His mother, Sophia Bingham Moseley, was the daughter of the mission-

ary, Hiram Bingham, and was the first white girl born on the island of Oahu, Hawaii.

Edwin was a serious, rather studious child, the youngest of nine children. In his early youth he was inspired by meeting and hearing such people as Edward Everett Hale, Henry Ward Beecher, Mark Twain, Frances Willard, John B. Gough, and J. T. Sunderland.

In high school Edwin studied zoology, physiology, intellectual philosophy, as well as Greek and Latin. His was the first graduating class of the Union City High School, and he was the youngest graduate, being then only fifteen years old.

After a post-graduate year in high school, young Moseley registered at the University of Michigan. In four years he received both his Bachelor's and Master's degrees, working his way through college almost completely. Again he was the youngest in his graduating class, and one of two who received a Master's degree.

Teaching at Grand Rapids, Michigan, was the next stepping-stone. Here it was he began to evolve his theory of experimental method of teaching natural science to high school students. Later, at Sandusky, Ohio, he began to put the theory into practice. It was not an uncommon sight to see the young teacher taking his students over many miles to view some phenomenon of Nature, or to display or experiment with some fact that had been learned in class. They went by electric car, by horse and buggy, by train, and by boat. No phase of natural science was too challenging for Mr. Moseley to bring before his students. They visited quarries, where they studied rock formations; they observed constellations; they identified plants, animals, birds, and all wildlife.

Dr. Frank J. Prout, President of Bowling Green State University, and once one of Professor Moseley's students, has said: "I doubt that very many students have had the opportunity to be guided in scientific thinking during high school days by as fine a thinker as Dr. Moseley."

During Dr. Prout's high school days, his teacher was tracing the submerged valleys of Sandusky Bay. Sandusky Bay is today one of the most important loading and unloading areas on Lake Erie. At the time Professor Moseley began his study, it was extremely difficult, due to the shallowness of the bay, for deep-water vessels to enter and leave. At a prohibitive expense the rock could be blasted from the bottom, but this was considered to be impracticable.

By a consistent and thorough survey of the depths at different areas, Professor Moseley traced a channel out through the bay that could, with a little blasting, be used for deep-water traffic. Members of his classes helped the young teacher with this work. They would drill holes through the ice and measure the depth of the water and thickness of the soft mud under the water. Boys and girls of his classes thus learned how preglacial ledges were formed, where to expect them, and other information concerning rock formation.

It was at Sandusky that the scientist began his collection of wild plants, which in time included the largest number of indigenous species ever to be gathered from such a small area. This research was embodied in a paper, "Sandusky Flora," published by the Ohio Academy of Science in 1899. Some specimens for the collection were brought in by interested students, who were offered small rewards for each new addition to the collection.

In 1904 Professor Moseley was elected president of the Ohio Academy of Science, after having served as secretary of that organization for the previous nine years. In that year he read his paper on the formation of Sandusky Bay and Cedar Point. This was later used for study in several colleges.

Between the Grand Rapids and Sandusky teaching positions, the young scientist accompanied Joseph B. Steere, who had been one of his professors at Ann Arbor, on an expedition to the Philippine Islands. The party of five spent about a year on the islands, collecting natural history specimens, many of which had not previously been described or named. Professor Steere named a beautiful kingfisher *Halcyon moseleyi*. Later, in 1922, Moseley went to the Hawaiian Islands, where he had opportunity to study marine life. There he discovered a new species of fish, the *Gonorhynchus moseleyi*, which later was thus named for him by the ichthyologist David Starr Jordan, president of Stanford University.

During his 25-year stay in Sandusky, Mr. Moseley applied himself to a number of other major research problems. The scourge of milk sickness was then a mystery to all who studied it, and Mr. Moseley, after years of the most painstaking effort, tracked it down to the white snakeroot, a weed on which cattle grazed. Much of the poison in the plant found its way into the milk of the cows that had eaten it, he found.

The Marsh Wren

By DANIEL SMYTHE

The boat shakes out its sails; it drives
  Hard by the marsh's rolling drifts.
With long waves curled beneath, it thrives
  As if content with what it lifts.

This is an hour of drumming air
  Tight on the canvas overhead.
We drink in windy time and share
  The good salt sting that is our bread.

And then across the marsh there comes
  A song like tiny bells in flight.
It breaks against the wind's deep drums,
  In waving grass beyond our sight.

We with our sail go by, rush by,
  Careening back to solid land.
The song, the water and the sky
  Are three great things we know at hand.

Abraham Lincoln's mother had died of milk sickness, and many other lives were taken by the disease during the days of the pioneers.

It affected both men and cattle, being called the "trembles" in the latter. Various superstitions were attached to it, which made the problem of tracing down the cause more difficult. Mr. Moseley spent years in traveling to farms in regions where the disease was reported, questioning, observing, experimenting, until he finally found the answer. While relatively rare today, the disease occasionally is reported, and Professor Moseley journeys to any point to track down the wild snakeroot.

His collection, now at Bowling Green, was begun at Sandusky. By travel, by trading with the British and other museums, and by consistent collecting, year by year he added to it until today it is one of the high points of scientific interest at the University. Included are a botanical collection of more than 3000 species, more than 600 mounted birds from all over the world, interesting minerals and fossils, mounted mammals from the north central states, a large number of marine invertebrates, and a collection of reptiles and marine fishes. Natural history specimens collected by him may be seen in considerable numbers in the British Museum, London; National Museum, Washington; American Museum, New York; Museum of Natural History, Chicago; and other museums.

Dr. Homer B. Williams, who had formerly been superintendent of schools in Sandusky, was asked to accept the presidency of the new Bowling Green State Normal College when it was established in 1914. With him he brought Dr. Moseley to head the biology department. For twenty-two years Professor Moseley conducted classes at Bowling Green, watching the growth of a small normal school to a state university. Here he continued his work with milk sickness and a new major project—long-range weather prediction. By a study of tree rings and their relative widths, he found that a 90.4 year precipitation cycle existed. He knew that tree ring widths are controlled mainly by the precipitation in the growing season of the year when the ring was formed. He began by collecting sections from ancient tree stumps from a wide area, often going into the woods himself to work with saw and axe. His laboratory is filled with polished sections from mighty trees brought from many states.

It is a tedious task to count the rings made by trees because of their somewhat indefinite demarcations and variations in width. Complicating the problem is the fact that precipitation is not the only factor that determines their growth. Such things as soil, location, amount of sunlight, attacks by parasites, and fire affect the growth of the tree.

This is the way Professor Moseley went about his study of about 350 stumps from nine different states: first he found the ring for 1890 and set a pin on its outer border. Then he would count forty-five rings toward the center (half of the 90.4 year cycle) and set another pin, and so on as far as he could go toward the center. Moving to the outside, he would set the pin next to the 1890 ring in the 1935 ring. It was essential to know when the tree was sectioned.

Now that he had the trunk divided into periods, he could relate the thicknesses to each other, and has been able to work out, with surprising accuracy to date, the rainfall picture for the next 90.4 years.

This work presents many practical angles to farmers, who already have begun using the information in crop planning. Professor A. E. Douglass of the University of Arizona, pioneer in tree ring study, has also done much research in this field.

Dr. Moseley was a good teacher as well as a competent scientist. Probably the one word that would best account for his success is meticulousness. If genius is "the infinite capacity for taking pains," then surely the title goes to Edwin L. Moseley.

He says the cardinal principle in teaching Nature is to have the courage and curiosity to take students out and let them study for themselves. At the third grade level he became interested in botany through the efforts of a teacher who took her pupils out on field trips and introduced them to plants that they should know. This opened an entire new world to the small boy, and he believes that it provided a firm foundation of curiosity and interest for his later work along these lines. If the natural sciences are taught to boys and girls, he contends, they will early learn to appreciate and be familiar with their natural environment—to realize why things happen as they do, and not have their conceptions hampered by foolish ignorances and superstitions.

In an article written for the college newspaper in 1921, Professor Moseley said: "Educational processes commonly used rely too much on books and recitations. In order that a child may understand, he must use his hands and senses as well as his brain." He gave several examples of people's being grossly ignorant of unusual phenomena just "over the hill" from them. In one instance a Canadian friend had lived for several years only a few miles from Niagara Falls and had never seen the cataract. Moseley thinks this is one of the worst of sins that man can commit against himself. If he taught his students nothing else, the professor showed them how to see and understand.

On March 29, 1937, Professor Moseley celebrated his 72nd birthday. At a banquet given in his honor, the educator was given the first emeritus professorship at Bowling Green State University, along with the title of Curator of the University Museum. He stated in his after-dinner speech that evening that he had but one regret, that he had not given enough praise to pupils who had earned it.

In 1941, Professor Moseley, at the age of 76, was given an honorary doctorate in humane letters by the university he had served so many years. At 79 years of age, Dr. Moseley, after teaching for forty-eight years, remains a student, ever seeking new knowledge.

The Hudsonian chickadee at the left, a visitor from the North, drops in on its cousin, the black-capped chickadee, and asks for a share of the local bird's suet.

Chickadee's Cousins Come Visiting

By LULU MAY ALER

Photographs by the Author

"CHICKADEE," to me, has always meant the vivacious "black-cap," who, with his immediate kin, frolics through his own particular wooded bit of eastern North America, playing host to all who come his way, whether bird or man. In the Ohio valley and South, it means the slightly tinier, almost indistinguishable Carolina chickadee of like habits. In either case, each sprightly band gathers into its winter-foraging retinue nuthatches, woodpeckers, and other hardy residents; escorts through its domain the warbler migrations of spring and fall; calls cheery greetings to every passing human throughout the year.

Along the Canadian border and north to the tree-limit, the black-capped chickadees mingle with their brown-capped cousins—the Acadian chickadee of the eastern provinces and the Hudsonian farther west. Although a few of the latter reside permanently in northern Minnesota, and a few more winter there, only two or three had been recorded as far south as Minneapolis until last winter. We were, therefore, exceptionally favored when two Hudsonian chickadees selected a Minneapolis public park for their 1943-44 winter resort, giving us our first opportunity to become acquainted with them.

The "becoming acquainted" was entirely on our side, for, unlike our companionable black-caps, they evinced not a spark of interest in us—flitted past our heads and hopped around our feet with as complete indifference as if we were stumps. We were accustomed to the remarkable tameness of such other visitors from the great evergreen forests as evening and pine grosbeaks and Bohemian waxwings, who show a confiding curiosity about the strange two-legged animals seldom met in their homeland. But to be accorded no more attention than an inanimate object was a new and uncanny experience.

Although our cloak of invisibility lacked wings to facilitate our keeping up with habitually active sprites, the Hudsonians lessened our handicap for several weeks by spending far more time, junco-like, on the ground than, chickadee-like, in the trees, apparently gleaning seeds dropped by the cones above. This gave us thrilling opportunities to feast our eyes on them; to note the taupe cap pulled down over their cheeks, leaving only a streak of white exposed instead of black-cap's broad expanse, and to admire the rusty-brown coat bordered on each side with a colorful cinnamon band. Struck by a shaft of sunlight, their brown garb appeared warmly rich-hued, but, in the shade, very dull. It blended as protectively with the dark branches and cones of their native

forests as black-cap's light gray and white mantle floes with his birches and other deciduous trees. The Hudsonian's quieter dress accentuated a semblance of dignity perhaps indicated by more puffiness of the forehead of some individuals.

Once four other observers and I were transported into fairyland. We were closely trailing the Hudsonians and their frequent companion, a red-breasted nuthatch, when, as if by magic, the pine-needle carpet and tree trunk bases around them and us became peopled with golden-crowned kinglets, black-capped chickadees, brown creepers, and white-breasted nuthatches—several dozen tiny wood-folk within a rod of us. We towered spellbound above them until, after brief but lively feeding, they vanished as quickly as they had come. Then we rubbed our eyes and gasped, "Was it true?"—each grateful that our wonderland had been confirmed by others.

The Hudsonian's puffed-up forehead gives this bird a distinguished silhouette.

At first the Hudsonians were exceedingly chary of speech, reserving their notes mostly for an exchange of greetings after a slight separation—even then, perhaps, only a lisp or two, not as clear-cut as black-cap's chip. But when they began to fraternize more constantly with their voluble cousins, roaming their treetops—although less airily acrobatic—they became more conversational. Their chatter, corresponding to black-cap's genial *Chick-a-dee-dee-dee-dee* (with *dees* ad infinitum) was a quaint, wheezy *Tchick-chi-daze-daze* (with never more than three *dazes*) accordant with a less buoyant personality.

Then on an unseasonably springlike day about New Year's, we heard a wonderful new song whose source we could not guess—a simple little song that did not carry far but displayed the most unusual trill we have ever heard. A few quick, variable, warbling notes led to this trill, a genuine trill, softly and leisurely alternating two different tones of unique richness, totally unlike the rapid series of notes on the same, or nearly the same, pitch characteristic of other bird trills. Imagine our surprise when we found the gifted artist to be none other than a Hudsonian chickadee! But why not? Consider his distinguished silhouette, his calm assurance, and the splendor of his sunlit attire. Off and on for three months we were treated to this musical gem, even on a sparkling sub-zero day.

Our fascinating guests were first noted in mid-November, near a spruce-bordered spring, having doubtless been driven south, with other northern birds found there, by a blizzard that hit us a fortnight earlier. In December, they and their pal, the red-breasted nuthatch, followed our chickadees to a window-sill tray provisioned by a neighbor whose evergreens bow across the fence to those of the park. Here they could always be found in rigorous weather, and often I was privileged to watch from indoors, only a few inches away. By moving their suet to the snowy lawn, I had the added pleasure of luring them to my portrait lens. On milder days the whole coterie of tray patrons continually circled this evergreen area—about three blocks long and one block wide—dropping in for a snack whenever they passed the feeder. But never once, so far as we know, did the Hudsonians cross a deciduous woods of similar length to our park feeding station near a more southerly conifer-bordered spring. Although their daily visits to the window ceased April first, we glimpsed one near-by as late as May seventh. A memorable half year they gave us—generous beyond our wildest hopes! We hope that they will return.

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The Oriole

By FRED F. BRADLEY

How haps it, Oriole, thou dost wing thy flight,
Like a meteor's flash on the screen of night?
And tarrying, in token glorify,
With tropic splendor all our northern sky!
At one vast comma was it Nature's choice,
To tack a scrap of sunset to a voice?
Or, did some burnished tulip—gold and black,
In wild Archaean jungles—aeons back,
Yearning Heavenward 'til its prayer was heard,
Long wistfully to be a bird?

Even when skies are gray and snow rules outside, you can still have beauty in—

Windowsill Gardens

By ANDREW S. WING

Photographs by Richard Averill Smith

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An interesting arrangement of both flowering and foliage plants for a window garden. Note plant pan filled with pebbles and in which flowering bulbs are growing and blooming. Philodendron vines are used in shadier spots, as they require no direct sunlight. Note space between pan and radiator and the insulating board in between.

THE friendliest homes usually have plants in the windows. You have noticed that, I am sure. The fragrant farm kitchen with its steamy air, and sunny windows filled with gay geraniums, begonias and Christmas cactus, is always a joy to enter. At the other extreme, plants fit beautifully into the decor of the smartest of modern apartments. Plants help to make the atmosphere of a heated room more humid; more healthful to live in. The more plants there are, the better for human beings, as well as for the plants.

There are two approaches to the question of growing plants indoors. One is from the standpoint of gardening, the other from the artistic angle of decorating the house with interesting forms and color. The seasoned gardener likes to keep his hand in, to putter with plants. Others turn to house plants as a means of making a home a pleasanter place in which to live. To combine these two objectives is the ideal and the purpose of this article.

Fortunately there is a long list of plants almost anyone can make grow in the average house or apartment, even one that has no direct sunlight. To grow the fussier things a more ideal environment is necessary, and for many of the flowering plants direct sunlight is essential.

The easiest and best way to maintain an attractive collection of plants indoors is to have a sunny window, preferably a bay window. In this window place a shallow, waterproof box, preferably metal if you can find one, and fill the box with pebbles or coarse sand to a depth of several inches. Set the pots directly in this and keep the pebbles moist, but never allow the plants to stand directly in water. Watering, spraying and pot cleaning then becomes an easy chore with no danger of slopping over on the rugs or floor. Best of all, the atmosphere surrounding the plants can be kept more humid than when the plants are scattered around the room. Such a box or pan can be set directly over a radiator, providing there is a shelf or insulating material underneath.

There is such a thing as having a "green thumb" with house plants just as in outdoor gardening. Not every gardener has the know-how to succeed. Most important is the matter of watering. Too much water is as bad as not enough—perhaps even worse at times. A safe rule is to water thoroughly when a plant needs it, then to wait until the earth seems dry before watering again. Naturally some plants require more water than others. The English ivies, philodendrons and Chinese evergreen will stand a good deal—will even grow in water. So will some of the bulbs. Cactuses, succulents and other desert plants require much

ss water, but even these must have water to live and loom. Then, too, the size of a plant regulates the mount of water required. A large begonia or fern, ith much leaf surface, will drink up water rapidly nd evaporate it from its leaves, while the thick-kinned cactuses and succulents are camels in com-arison.

The question of pots is also important. Some of the naller plants will live in painted or glazed pots even ithout drainage holes. But for the larger plants it is tter to have drainage, although these may be set in corative pots or jardinieres *provided* that the water vel never rises above the bottom of the pot. Most lants abhor wet feet. To insure effective drainage in jardiniere or deep saucer, place a few bits of roken pot or gravel under the pot. In a large jar an verted saucer will do nicely.

If you can not remember to water your plants, get ne of the patented pots with an automatic wick aterer. If your tendency is to drown them, you might tter get a goldfish bowl and start a water garden.

The modern trend towards climbing, trailing and inging plants, such as the ivies and philodendrons, to be commended. Too many of the plants favored y our parents and grandparents in the horse and uggy days were stiff, forbidding, and more durable an beautiful. Giant rubber plants, potted palms, nsevieria (snake plant) and their like have their lace in hotels and conservatories but re not well suited to the modern home. warf orange trees, on the other hand, e well worth having, and, if properly ared for, will actually bear fruit. Scale our plants to the size of your rooms nd windows. Too many small plants uck in the backs of donkeys, deer and ephants will look fussy, while over-zed plants in small windows will give crowded effect.

Good house plants are never cheap, nd price ceilings do not apply now. owever, if you look around you can robably find a good flower shop or eighborhood greenhouse where you an get your money's worth. Small to edium-sized plants will always be heaper than the larger flowering sizes, nd that is a good way to start a small ollection or to brighten up your pres-nt window garden. If the small gera-iums, begonias and foliage plants seem need more room to grow in, trans-lant them to larger containers. Re-member, however, that geraniums (pelargoniums) and some other flowering plants will bloom better if their roots are slightly pot-bound than if they have too much space in which to spread out. Invert the pot, hold it in one hand and slap the bottom until the plant comes out. If the roots are crowded around the ball of earth, it is time to repot.

The earth used for potting should be fresh, loose and friable. Equal amounts of loam, humus and sand make a good combination. However, any good garden soil will do, and even clays can be used if they are lightened up by mixing in sand, cinders and a bit of compost. Do not leave in large gravel or stones—put them in the bottom of the pots for drainage. Earthworms are a nuisance, too, in a potted plant. When repotting, remove part but not *all* of the old soil. Dried cow manure or well-rotted and broken-up manure may be used. Liquid manure and plant tablets can also be used for fertilization. But do not overdo the plant food—better too little than too much.

Ordinary clay pots are cheapest and as good as any. Paint the outside, if you wish, any pleasing color. That will reduce evaporation and make the pots more attractive and easier to clean. Glazed and decorative pots are good too, and may be handsome, but avoid the tricky containers that have no drainage and no space for soil. Your plants will not be happy in them.

A better way to have a collection of small plants,

clever window arrangement em-hasizing such flowering plants as eraniums and begonias, with English y helping to hold the composition gether. Attractive pots and vases always add interest and beauty.

Washing dishes is no chore at all in a kitchen with a view like this. Attractive bits of old glass add interest and color to the arrangement. Kitchens, being steamy, are good places for house plants.

many of which are very decorative, is to group them in a dish garden or a glassed-in terrarium or Wardian case. These can be very attractive, and are better for the plants since they have room to grow, provided there is sufficient earth and watering is done regularly. Plants that like dry conditions should be kept in separate containers—or at least in different levels of the same container—from plants that are moisture lovers. The best place for mosses, ferns and the other wild things is in an enclosed container such as a goldfish bowl or a large bottle, while the desert plants are usually better off in an open container. In the enclosed terrarium, little water is required, and if properly planted these will last for years with little care.

I once had a large rectangular bowl with a glass cover, which contained a collection of woods plants for a number of years. Even small evergreen trees will stay alive, and a naturalistic effect with stones, lichens, mosses, small ferns and miniature ivy was obtained. These things do not bloom, and require little sun. So perfect is the environment for plant growth, due to the humidity and evenness of temperature, that propagation from cuttings is easy. Even azaleas, boxwood, holly and other woody plants that are hard to root can be started in such a case merely by making short cuttings and sticking them in with the other plants.

The atmosphere of the plant room is most important. Gas fumes are fatal to many plants, as I learned to my sorrow when we moved to a city apartment a year ago in September. My beautiful collection of Rex and other begonias, which I had been building up for several years, just up and died. I had rooted these in sand and water and grown them in every kind of soil and container, with hardly a failure, until we came to New York. Then they just died a slow death, and the only thing I can figure out is that the gas fumes from the cook stove did it, as sun and other conditions were favorable enough. Geraniums lived but refused to bloom, as they do in my office, but that is simply a matter of not having enough hours of sunlight.

So until peace comes and makes all-year-round country living possible again, I must be content with house plants that, like the ailanthus, the "tree that grows in Brooklyn," are amenable to city conditions. Fortunately there are any number of these that are attractive even though for the most part they do not bloom. Of course, people who have south windows, or outdoor window boxes, can and do grow all manner of things, even in the slummiest parts of this metropolis. I am constantly amazed and heartened by the love of people for plants, as shown in the heart of Harlem and other poorer residential sections, where window boxes and sills are often filled with plant collections that would put many residents of Park Avenue to shame. Indeed, window gardening is one of the most democratic of hobbies. Almost anyone can do it.

Well do I remember an amazing collection of plants, all growing in tin cans, that lined the outside of an old farmhouse up in the mountains of New Hampshire. The farm wife, a simple soul, was proud to show me her plants of which she had no less than a hundred, maybe more. And she had grown every one herself from a seedling or a cutting given her by a neighbor or a friend. Many of these plants were unusual, and one at least, the "money plant," I had not seen before that time. The humble containers were at once forgotten when one saw the amazing collection and realized the love that this lonely country woman had lavished on it.

And so I say let us have more plant friends in our homes. I care not whether it is a splendid hothouse azalea, or a rose, or a chrysanthemum, or just a humble red geranium or coleus. Let us have plants, even if they are only a carrot top sprouting fern-like leaves, or a sweet potato vine, or a lusty little avocado tree growing out of the top of a milk bottle

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south. Time given is Standard Time; add one hour for War Time.

Astronomical Events for 1945

By ISABEL M. LEWIS

Four eclipses will occur in 1945, two of the sun and two of the moon. On January 13-14, Eastern Time, there will be an annular eclipse of the sun, in which the path of the annulus becomes so narrow, near the middle of its course, that it is only a mile or so in width. The duration of the annular phase is less than fifteen seconds. In this case the tip of the shadow cone of the moon nearly grazes the surface of the earth. The path lies for most of its course in the Indian Ocean, touching land only in the extreme southeastern part of Africa at sunrise, and the northwestern tip of Tasmania late in the afternoon. Partial phases of the eclipse will be visible in all parts of Australia and New Zealand, and in part of New Guinea and the Solomon Islands.

On June 25 there will be a partial eclipse of the moon in which 86 hundredths of the moon's diameter will be immersed in the earth's shadow at time of greatest eclipse. This eclipse will be visible in the Pacific Ocean, Australia, Asia, the Indian Ocean and the eastern and southern parts of Africa.

One of the most interesting astronomical events of 1945 will be the total solar eclipse of July 9, in which the path of the total phase will first touch the earth at sunrise in Idaho, a little to the northeast of Boise, and will pass diagonally across the states of Idaho and Montana into Manitoba. There the total phase will be visible a few miles to the south of Regina, near Yorkton, and at a number of other Manitoba towns, and on the shores of Dauphin Lake, and Lakes Manitoba and Winnipeg. The path will continue northward to the shore of Hudson Bay in longitude 90 degrees West of Greenwich. From there it will pass over Hudson Bay and Hudson Strait to Greenland and across the North Atlantic Ocean to Norway and Sweden, where total eclipse will occur near midday.

The duration of the total phase, which is very short, will reach its maximum of 1 minute 15 seconds on the eastern coast of Greenland in latitude 70 degrees north, and longitude 20 degrees west. The path of totality will pass diagonally across Russia from Lake Ladoga to Turkestan, to the north of Leningrad and Moscow, and directly south of Kuibishev. The town of Rybinsk, to the north of Moscow, lies directly in the path. This eclipse will probably be well observed in Russia as it will pass over many populated places. It will occur so close to sunrise in the United States that it will not be seen to advantage in this part of its path. The duration will be less than a minute and the path only thirty miles or so in width in the United States. It will be seen to better advantage in Canada, where the path will be wider, the duration longer, and the sun farther above the horizon. This eclipse will arouse considerable interest in the United States, however, because it will be the last total eclipse visible in this country for some years to come.

On December 18-19 there will be a fine total eclipse of the moon, seen in all parts of North and South America, and visible in part in Europe, Asia, and Africa.

The rings of Saturn will continue to be at nearly their widest opening in 1945, and the planet will be a beautiful object in the telescope. It will be found during the entire year in Gemini, and is visible nearly all night throughout the month of January. It now exceeds all bright stars in brilliancy, with the exception of Sirius. The planet will remain in the evening sky until the date of its conjunction with the sun on July 6. It then passes to the morning sky. It will be in quadrature with the sun on October 18, and will then rise about midnight.

Jupiter is in Virgo at the beginning of the year and rises shortly before midnight. It will remain in this constellation throughout the year. It will be in opposition with the sun on March 13, when it will be visible all night, and will be in the evening sky until it comes into conjunction with the sun on October 1. It will then pass to the morning sky, where it will be found for the remainder of the year. Jupiter will be in conjunction with Mercury on October 1, and in conjunction with Venus on October 30.

Mars will be found in the morning sky early in January, but too close to the sun to be well observed. It will then be in Sagittarius, and will pass during the year from that constellation through Capricornus, Aquarius, Pisces, Aries, Taurus, and Gemini, into Cancer, where it will be at the end of the year. It will be neither in conjunction nor opposition with the sun this year, although it will be approaching opposition with the sun at the end of the year, when it will have become as brilliant as Canopus. It will be, however, in January of 1945, no brighter than a star of second magnitude and poorly placed for observation in the southeastern sky before sunrise. Its distance from the earth on January 1 will be more than 224,000,000 miles, and at the end of 1945 this distance will have decreased to about 60,000,000 miles. Mars will be in conjunction with Mercury on January 26, and with Saturn on October 26, rising about midnight at quadrature on October 12.

Venus starts the year as a brilliant object in the evening sky and is approaching the phase of a half-moon, which it attains at the time of its greatest elongation east of the sun on February 2. Venus is at its greatest brilliancy on March 10, and again on May 21, about 36 days before and after its inferior conjunction with the sun, which occurs on April 15. When it is at its greatest brilliancy it resembles the crescent moon in the telescope at the time when it is five days old. Venus remains in the morning sky from April 15 on to the end of the year. It is at its greatest elongation west of the sun on June 24 and then shows the phase of a half-moon in the telescope, as it did on February 2 at eastern elongation. From then on to the end of the year it will be in the gibbous phase, slowly decreasing in brightness as it recedes from the earth, and gradually drawing in closer to the sun in the morning sky.

God in the Morning

By OSCAR OSTLUND

He opens his mind to the flaming clouds,
Across the glowing blue;
To a rhapsody of color
At the birth of something new.

Mercury, the most difficult of all the planets to keep track of because of its nearness to the sun, and its rapid revolution around it, will be in the morning sky at the beginning of the year, and at its greatest elongation west of the sun on January 13. It will then be low in the southeast in Sagittarius and poorly placed for observation. There will be three more western elongations of Mercury during the year—on May 11, September 6, and December 26. For a week or more before or after these dates is the time to look for this elusive little planet in the morning twilight. The most favorable time to observe Mercury in the morning sky in 1945, in the northern hemisphere, will be near the time of elongation on September 6, when it will be farthest north. The dates of the eastern elongations of Mercury, when it will be found at its greatest distances east of the sun in the evening sky, are March 26, July 23, and November 17. The most favorable of these times for observing the planet in the evening sky will be near the time of the elongation of March 26, when the planet will be in Pisces north of the equator. In general all of the planets are seen to the best advantage in the tropics, especially at rising or setting, as their orbits are inclined at a greater angle to the horizon than they are in higher latitudes.

The outer planets Uranus, (Continued on page 50)

What happens when the sundew dines on cheese. First is the leaf with normally expanded tentacles. Then many of the tentacles reach for a particle of cheese placed in the center of the leaf two hours previously. In the third drawing the feast is in full swing at the end of the first day. Next, at the end of the second day, with the cheese almost disappeared and the tentacles beginning to relax. At the end of the third day the cheese is completely consumed and the flow of digestive secretion stopped. Finally, at the end of the fourth day, the feast is over and the tentacles have resumed their normal position.

Tempting the Bog-Trappers

By HARRY STANTON TILLOTSON

NATURE provides the sundew with a clever and effective trap that keeps it amply supplied with food. The sticky, ruby-tipped glandular hairs, which fringe this tiny bog-dweller's leaves, lure the flying insect to almost certain death.

Soon the adjacent hairs or tentacles bend toward the victim, which is gradually pushed toward the center of the leaf. Here the almost sessile central glands secrete certain enzymes that prepare the "meat" for consumption. Sometimes the flow of this secretion is so great as almost to drown the fly, or other insect, and before many hours all the edible material in the insect's body has been utilized by the plant and the tentacles again spread to snare a meal.

In order to study the sundew's reaction to forms of nitrogenous foods, other than its accustomed fare of proteins furnished by insect bodies, a number of plants were gathered in the boglands of the southern New Jersey pine barrens and placed in my cold-frame for observation. A quantity of the bog soil and sphagnum moss was also gathered to simulate as nearly as possible the natural environment of the plants. In the cranberry bog where the sundews were found, there were specimens of the round-leaved sundew *Drosera rotundifolia;* thread-leaved sundew, *D. filiformis;* long-leaved sundew, *D. longifolia.* Among these were also found many of the intermediate type listed by the botanists, Britton and Brown, as *D. intermedia.*

For the purpose of the experiment, three leaves of the long-leaved sundew on as many plants were selected for observation. In the center of one leaf was placed a very small morsel of roast beef; on another, a tiny piece of hard-boiled white of egg; on a third, a small piece of cheese. In about two hours the digestive processes were well advanced and the tentacles on all leaves had reached toward the unusual meals.

The consumption of the egg particle was much more rapid than that of the other foods, and at the end of twenty-four hours only a trace remained, while the microscope revealed that the plant that had been offered a cheese diet relished it almost as much and very little was left of this food. The disposal of the meat was much slower than that of the other foods, but this may have been due to the fact that the leaf used in the test was perhaps on the decline and accordingly less sensitive to stimulation than the others. This seems to be suggested by the condition of the leaf at the end of the fourth day, by which time it had turned black with the tissue of the meat still visible in the center. By this time the other leaves had finished their unusual meals and expanded their tentacles.

While the sundew may prefer Nature's method of supplying it with the needed proteins, it is evident that it appreciates a change from its accustomed meals, although served in an unconventional manner.

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Peace

By A. M. GILMAN

When the fog shuts down,
The trees, all ghostly in their misty gowns,
So silent are; no whispering of breeze
Among the drowsy leaves.

A bird stirs on its nest
Deep in the branches, where it seeks its rest.
She speaks her mate with faintly muted sound,
When the fog shuts down.

The School Page

Edited by E. LAURENCE PALMER

Professor of Rural Education, Cornell University
and Director of Nature Education, The American
Nature Association

ARE DUCKS JUST RED POINTS?

All last summer, a cottager on Cayuga Lake in central New York made a practice of feeding the ducks that came to the shore line of her property. She and her neighbors had posted their lands against hunting because they liked to enjoy the wildlife that came to them from the lake. However, during the last months of the summer of 1944, the water in the lake became very low, and a stretch of beach controlled by the state extended all along the shore between the private land and the water of the lake. Over this land, no one individual had any legal rights on the morning when the duck season opened. It is the purpose of this article to consider an incident that took place on this land on that morning, and to suggest that teachers consider similar problems in any of their classes concerned with an understanding of what is good citizenship.

On the morning that the season opened, a hunter approached this strip of land adjacent to the posted property. In a wild fusillade directed at ducks on the ground and water, and in the air, he soon had a bag of fourteen mallards. He makes no bones of the fact that he got four of the ducks at one shot as they sat on the water, or that he warned one of the property owners to get out of the range of his fire as he intended to shoot the ducks no matter what the sentiments of the property owner might be.

This is not a consideration of what the rights might have been in the case. The hunter had the legal right to get all fourteen of his ducks at one shot if he could do so. He had the right to shoot on the narrow footage of land controlled by the state and adjacent to the private property, and perhaps he had the right to warn a property owner of his intention to shoot ducks that that citizen considered an asset to his cottage property. The fact that one man in a few minutes destroyed, for his own benefit, what other men had made some sacrifice to maintain for the enjoyment of many, has not the slightest legal standing in so far as the lover of live wild ducks is concerned. The hunter defends his acts on the ground that he was within his legal rights. He says that he cannot live on the allowance of red points given him by his government in time of war, and so is forced to supplement his meat rations with the ducks he gets, forgetting, of course, that millions of his fellow citizens seem to be getting along perfectly well on the allowances they have. He boasts that each year he gets more than one duck for every shell he uses, and in this way claims he is making an efficient harvest of a public wildlife resource.

Matter of Viewpoint

Let us look at this situation from a number of viewpoints. It is my understanding that the local fish and game club, of which I have been a member, did not approve the acts of the hunter in this case. They claim, and probably rightly, that shooting into a flock of ducks sitting on the ground or on the water is unsportsmanlike, and that it necessarily results in the making of cripples that may diminish the available supply of ducks without increasing the harvested supply. They claim that such shooting makes too many ducks gun-shy and man-shy, and increases the difficulty of harvesting "the crop." Furthermore, they claim, seemingly with entire justice, that there is little sportsmanship or good marksmanship involved in shooting at sitting birds, even though they might be willing to admit that such a practice might, for the moment, yield more birds per shell fired than by following the system of picking the birds as they fly by a blind.

And now for the property owner. Just what were his rights? In the eyes of the law of the land, they were practically nil. So long as the hunter did not menace him with a gun, step on his posted property, or destroy his property, he had no rights whatever. This is partly his fault, strange to say, because the private person who loves Nature—as do most of us—does little about keeping informed of the laws that are made or to see that his interests are represented. I suppose that the private property owner could have gone out in a boat and sat there among the ducks and taken the chance of getting hit by shot, and had he been hit by shot he no doubt would have had redress. He had as much right on the state land next to his land as did the hunter, and the hunter certainly had no right to order him to move elsewhere on state land because he intended to shoot on it. And the land owner had every right to feed ducks on his land, even though by doing so he made certain wild animals less wild and more likely to trust a man than is good for their survival.

However, the point is that somehow we ought to be able to work out a system where all could enjoy a public natural resource. It would seem that a private property owner should have priority rights over the land next a waterway when it is exposed by unduly dry weather. It would seem that provision should be made whereby property owners should be allowed to feed and enjoy wildlife, particularly if they provide adequate territory either side of the feeding site in which shooting will not take place.

How About Golden Rule?

Somehow or other this business of always driving a close bargain, of getting your last ounce of flesh out of the rights society offers you, does not seem to be what most of us favor. This hunter, who insists to the last letter of the law on having his rights, is greatly offended when motor boats approach his fishing boat when it is anchored. He resents the fact that the motor boat may interfere with his fishing activities, and threatens dire reprisals should the boats come too close to him. And yet the motor boat enthusiasts have the right to do all sorts of things to him in his fishing boat, and, so far as I know, no one has ever tried to drive a close bargain by driving his boat close to a fishing boat. There are things in this world that those raised on the Golden Rule philosophy just do not do whether those things are within the law or not. And it is these things, these principles of right and wrong, of consideration for the other fellow, that schools can do well to teach. It is conceivable that an informed public, convinced of the justice of the Golden Rule, would need no laws whatever.

The hunter referred to in this incident is a good friend of mine, in spite of the fact that he does not look on this particular situation in the way I do. I am sure that I am as well fed as is he, even though I do not supplement my rationed red points by destroying some wild birds that I know are beloved by a fellow citizen. I have no intention of feeling any holier than anyone else by defending my viewpoint, but I do know that a few wild ducks winging their way in against an evening sky, or guzzling food from my hand as I sit on the shore, are worth more than the red points I might save by destroying those creatures for my own benefit, and in so doing depriving others of the pleasure they might get from the same animals.

There will be those who will defend this hunter on the ground that he harvested a big bag of ducks with few shells, but this does not take into consideration cripples that must be produced by shooting into flocks. There will be those who will defend him on the grounds that he was within his legal rights. I am not pretending to defend or to criticize him too adversely, but I do contend that if he can see nothing but red points in a flight of wild ducks he is missing much out of life,

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and if he persists in driving a hard bargain with his fellow human beings, even though he is within the law, he is likely to miss much of the comraderie that is shared by those who enjoy the finer things in wildlife, just as they develop the finer side of human life.

Science Movie

The Motion Picture and Speakers Bureau of the Westinghouse Electric and Manufacturing Company, 306 Fourth Avenue, Pittsburgh, Pa., announces that the film, "Scientists for Tomorrow," is available for showing without charge to high schools, and school and civic groups. This film tells the story of the annual Science Talent Search sponsored by Westinghouse and administered by Science Clubs of America. Full information about the film may be obtained from the address given above.

Conservation Texts

Indiana's Department of Conservation, the State Superintendent of Public Instruction, Indiana University, and Purdue University are cooperating in the preparation of a series of conservation textbooks for use in Hoosier schools. The first in the series is *Conservation of Plants,* written by J. L. Van Camp, Purdue forester. There will be five books in all, and it is hoped that the entire group will be available by the middle of the school year.

Fly's Future Black

The postwar future of the house fly is serious, according to entomologists of the U. S. Department of Agriculture, who have been very busy during war years on insecticide investigations. Besides the development of DDT, which appears dangerously lethal not only to insect pests but to many beneficial insects, a new poison from a plant native to Mexico has been developed. This has been found even more fatal to flies than pyrethrum, the base of most present fly sprays. Also there has been developed a method for purifying pyrethrum, making it odorless and confinable to a can that can release a fog of insecticide called an "aerosol." Pyrethrum is deadly to many insects and harmless to man, save for some unfortunates who are allergic to it.

Wants to Correspond

Through a little note in *Nature Magazine,* writes Iris Huffman, "I have become acquainted with a group of boys and girls who have the same interests as I have." Now her younger brother, Glenn Lowell Huffman, who is an enthusiastic young naturalist of eleven, and interested in birds, trees and snakes, would like to correspond with others similarly interested and about his age. His address is Stockton, New Jersey.

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MR. WISE GUY—THE INDIAN MYNAH

(Continued from page 14)

half a century, states he has never seen it attack any bird. He frequently watches mynahs, Chinese doves and sparrows feeding together in perfect amity. He also feels the nest-robbing charges are vague and unproved. Pairs of mynahs will fight other pairs of mynahs for nesting sites during the nesting season, but that is quite a different matter. Mr. Munro points out that the little barred dove has increased enormously in Hawaii in recent years although nesting in the vicinity of mynahs.

Mr. Munro does believe that foreign bird diseases of bird malaria and sleeping sickness have been rightly blamed for destruction of native birds, and that the mynahs, as well as other imported birds, are thus an indirect menace to Hawaiian birds.

If, however, a part of the mynah's record in Hawaii is shady, a larger part is encouragingly bright. The mynah was brought to the islands by Dr. William Hillebrand to help fight the army worm, a caterpillar that plagues all grazers and cane planters, and in this activity the bird has been of unmeasured help. For when it goes after insects, the mynah's vigor and ingenuity are boundless.

Mynahs have been seen following a flock of guinea fowl, snapping up the insects disturbed by the grain-hunting guineas. When a bright-eyed mynah spots a grass fire it sounds "mess call," and a flock quickly gathers to feed on the roasted insects. Mynahs will collect around a fire of coconut husks, eager-eyed to catch the escaping bugs, and will even follow a tractor while it flattens out the native grasses, releasing insects.

Among scores of Hawaiian bird-lovers mynahs have become popular pets, partly because they can be taught to imitate human speech, and partly on account of their intelligent, near-human personalities. The Hawaiian mynahs, which are classed scientifically as *Acridotheres tristis,* lack the great talent for mimicry of their relatives, the Eulabes mynah, reputed to be the finest of all bird "talkers." Yet the Hawaiian mynah can imitate a number of simple sounds, and its talent for catching an inflection has fooled more than one human mother who thought she heard her infant's cry. Young mynahs often show a number of cute tricks, and one delighted her mistress by hiding in a coffeepot and playing peek-a-boo over the rim. Another amused women visitors by attempting to steal their bobby pins from a shoulder perch.

At present mynahs are protected by law in the Hawaiian Islands, but if the unlikely day ever comes for banishment, it is a hundred-to-one guess the bird will talk, or gag, his way back.

A LOST GENERATION OF ELMS

(Continued from page 16)

by Garman and Forbes. Natives reported that, while the sections had once been rich in elms, "the land just wasn't good for them any more" or "the blight got them." They had tried importing the American elm from other states, but no matter how healthy the seedlings were, they soon sickened and died. To be sure, there were occasional native elms that seemed to be doing all right, but they were few compared with their former numbers.

The representatives examined the occasional native trees. Their sizes indicated that some of them had lived 75 or 100 years—long enough to have been through the epidemic of the 1890s. Yet they were still healthy. Evidently they contained some quality that rendered them immune. A few seedlings were carefully dug up and taken back to the laboratories where phloem necrosis infected parts were grafted on them. They remained healthy! Nature herself had given Science the answer.

Now 13,000 seedlings from those trees are undergoing tests at the Forest Pathology Field Office of the U. S. Dept. of Agriculture on the outskirts of Columbus, Ohio.

Although they will have to remain under observation for a year or two before experts can be positive they are the answer to the elm lover's prayer, Mr. Swingle believes they will not disappoint him. These disease-resistant trees cannot, of course, redeem the present generation of elms, but they can save the variety from extinction.

Both Mr. Swingle and Mr. Irvin are looking forward to the day when quantities of phloem necrosis-resistant trees may be released to city foresters and nurseries throughout the country, and may in turn take their places on the soon-to-be-denuded curbs, boulevards, parks, schoolyards and other public properties, as well as on individual estates.

Already efforts are under way to interest civic organizations in the project of replanting elms as memorials to the men who have given their lives in the present war. Certainly the replacing of the lost generation of elms with young vigorous seedlings as a memorial to a lost generation of dauntless lads will have more appeal to the average citizen than the mere purchase of cold, soon-to-be-forgotten masses of stone.

While it is true that hundreds of thousands of graceful, full-grown elms are doomed to disappearance for several years, it is equally possible that they may be slated for a comeback. And when they do make their return appearance, the picture they will present will be far sturdier and just as eye-pleasing as that made by the stately old branches now shedding American traditions and mellowness on hosts of towns.

ASTRONOMICAL EVENTS FOR 1945

(Continued from page 46)

Neptune, and Pluto remain for long periods of time in the same constellation, moving slowly relative to the earth because of their great distance from it. Uranus may be seen at times, when one knows exactly where to look for it, as a faint star of 5th magnitude, but Neptune and Pluto are always telescopic objects. The brightness of Neptune is about that of an eighth or ninth magnitude star, while Pluto is about equal to a star of 15th magnitude and can be seen only in the largest telescope. In 1945, Uranus will remain in the constellation of Taurus, advancing only a few degrees eastward during the year from a point north of the V-shaped group of the Hyades in the direction of the Horns of Taurus, and part of the time retrograding, or moving westward. Neptune will remain throughout the year in Virgo, within a few degrees of the star Gamma Virginis and very close to the celestial equator. Pluto is now in the constellation of Cancer and can be found only with the aid of a good star chart of the region and a large telescope. Uranus has four satellites and Neptune one. Pluto, so far as is known, has none. The satellites of Uranus and Neptune can be seen only with the aid of powerful telescopes, which are required also to show the disks of these planets. In smaller telescopes they appear star-like. Neptune is greenish in color, Uranus and Pluto yellowish.

In 1945 sunspots should begin to increase appreciably in number and frequency of appearance, as the sunspot minimum period was probably passed a few months ago. The solar corona visible during the total solar eclipse of July 9, 1945, will probably be of the sunspot minimum type, however, with long equatorial streamers and short bushy polar rays.

Conservation Goals

Following up the resolution, adopted at its annual meeting, urging increased emphasis on conservation education in the schools, the National Education Association presents a splendid statement of the goals of conservation education in the November, 1944, issue of its *Journal.* This basic outline is presented by Vernon Carter, supervisor of the Conservation Department of the Zanesville, Ohio, public schools. The Association also urged the immediate preparation of appropriate materials for school use, and Mr. Carter's analysis proves an excellent foundation upon which to build.

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The bird's song had to be amplified several thousand times. That means that extraneous sounds, such as wind in trees, running water, airplanes, farm machinery, and notes of other birds were amplified too. For that reason many promising attempts at recording proved failures. The songs here recorded represent the best results of many efforts.

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4. Hermit Thrush	4. Yellow-bellied Sapsucker
5. White-throated Sparrow	5. Alder Flycatcher
6. Whip-poor-will	6. Olive-sided Flycatcher

Birds of Fields and Prairies

No. 4 A	*No. 4 B*
1. Bobolink	1. Prairie Horned Lark
2. Meadowlark	2. Savannah Sparrow
3. Western Meadowlark	3. Lark Sparrow
4. Vesper Sparrow	4. Killdeer
5. Field Sparrow	5. Spotted Sandpiper
6. Red-winged Blackbird	6. Burrowing Owl

Birds of Northern Gardens and Shade Trees

No. 2 A	*No. 2 B*
1. Song Sparrow	1. Chickadee
2. Robin	2. Wood Pewee
3. Catbird	3. Chipping Sparrow
4. Baltimore Oriole	4. Red-eyed Vireo
5. Yellow Warbler	5. Yellow-throated Vireo
6. Flicker	6. Warbling Vireo

North American Game Birds

No. 5 A	*No. 5 B*
1. Ruffed Grouse	1. Gambel's Quail
2. Bob-white	2. California Quail
3. Wild Turkey	3. White-winged Dove
4. Dusky Grouse	4. Woodcock
5. Prairie Chicken	5. Canada Geese
6. Chachalaca	6. Mallard Duck

Birds of Southern Woods and Gardens

No. 3 A	*No. 3 B*
1. Indigo Bunting	1. Mockingbird
2. Pine-woods Sparrow	2. Brown Thrasher
3. Pine Warbler	3. Cardinal
4. Orchard Oriole	4. Summer Tanager
5. Yellow-breasted Chat	5. Chuck-will's-widow
6. Carolina Wren	6. Barred Owl

Birds of Western North America

No. 6 A	*No. 6 B*
1. Wren Tit	1. Lazuli Bunting
2. California Thrasher	2. Blue Grosbeak
3. Nuttall's Sparrow	3. California Shrike
4. Fox Sparrow	4. California Purple Finch
5. Western Tanager	5. Plumbeous Vireo
6. Black-headed Grosbeak	6. California Woodpecker

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STUDENTS OF NATURAL WONDERS

(Continued from page 24)

conscience is already being felt, and expectations of future results give some of the best grounds there are for optimism in conservation. It is one of our greatest hopes that these school programs—concrete, spontaneous, directed with inspiration, and focused on the aspects of Nature that actually are at hand—will continue to increase in number and become more vital in the schools that sponsor them. There are no surroundings without some such possibilities for the leader with vision, and there are no conservation speakers with half the influence of the Gib Mousers who can recruit Students of Natural Wonders. My red face may not come entirely from embarrassment at lost opportunities. There is also an exuberant admiration — and a high expectation. It is something more than a coincidence that the initials of the SNW club can likewise be made to spell out: Saving of Natural Wealth.

Dr. Maguire Back

Dr. Bassett Maguire has returned to the New York Botanical Garden from an eight-month South American expedition sponsored by the Garden, with financial aid from the John Simon Guggenheim Memorial Foundation and the American Philosophical Society. In British and Dutch Guiana, Dr. Maguire collected a total of about 15,000 individual herbarium specimens, covering approximately 2500 species. In addition, some 500 samples of tropical woods were gathered. The plant explorer made more than one thousand photographs in the regions visited, his pictures of Table Mountain, in Surinam, Dutch Guiana, being the first ever made of this newly discovered mesa. A complete report of his trip will appear in a later issue of the *Journal of the New York Botanical Garden.*

Swifts in Winter

"One of the most important ornithological discoveries in at least two decades," is the way Frederick C. Lincoln, U. S. Fish and Wildlife Service bird migration expert, describes the report of thirteen leg bands from chimney swifts sent in through the American embassy at Lima, Peru. Where the swifts spent their winters has been a riddle of bird migration. Indeed, it was so mysterious that some naturalists were tempted to espouse the ancient theory that certain birds buried themselves in the mud of swamps, and hibernated until spring. Now these thirteen bands—eight from birds banded in Tennessee and one each from Illinois, Connecticut, Alabama, Georgia and Ontario—solve the mystery. The birds were shot by Indians in the River Yanayaco area of Peru, and the bands bore dates ranging from 1936 to 1940. Chimney swifts are found over much of North America, east of the Rocky Mountains, during the summer months. In the fall they gather in the southern states in enormous numbers and in flocks. Suddenly they disappear, not to be seen until the following spring. Now we know that at least some of them go to Peru.

County Forests

In 1943 Indiana's Legislature passed a law authorizing boards of commissioners of counties to purchase or otherwise acquire lands to create permanent public forests. The law authorized the creation of county forestry funds, and otherwise outlined procedure for the establishment of a system of county forests. Indiana started out as a forest state, with about nineteen and one-half million of its twenty-three million acres covered with timber. Today the situation is about the reverse, with about three million acres in woodland, much of it cut over one or more times. To give stimulus to the county forest law the Indiana Economic Council, 609 Board of Trade Building, Indianapolis 4, Indiana, has brought out a fine booklet entitled *County Forests for Indiana.* This should not only be of marked assistance in aiding the Hoosier State on its way to forest restoration, but it shows the way to other states where a similar system could and should be established.

Army No Hoarder

Many people seem to have the impression that the Army is building up huge stocks of foodstuffs. However, Major C. S. Bryan of the Office of the Quartermaster General told the National Victory Garden Institute that if Army food stocks were transferred to American pantry shelves there would not be enough to last the civilian population of the nation a single week. Under the circumstances, he urged, there should be no let-down in the production of food, and the Victory Garden is still important.

Natural "Bifocals"

Some animals, particularly shell fish and deep sea fish, are equipped by Nature with what amounts to bifocal spectacles, says the Better Vision Institute. In such creatures the lenses in the eyes are inflexible and cannot be accommodated for near and far vision, as in humans. So Nature has provided two—and sometimes three—retinas for seeing at different distances. Eyes of these animals are generally tubular, with the retina for near-seeing at the bottom of the tube, and the retina for far-seeing at the side.

BY WAY OF APOLOGY

By EGINGTON FRANKLIN

A young sparrow fluttered down from a nest over the door of a public garage in Chicago's business district last August. It landed inside a large, plate-glass window, where it was discovered by its mother. She coaxed and demanded that her child come out into the street where it was safe. The little lady who managed the garage watched the proceedings, and, after the mother sparrow had left, picked up the young bird and took it into her office. She tried different foods, finally finding that a fly was most acceptable. So she swatted flies, and, when she left at night, instructed her brother to continue swatting. By this time the young sparrow was convinced it had found a new mother, and had also discovered that it was warm up under the light at the top of the desk, and there it sat.

This went on for several days, the demand for flies getting louder each day, and then the foster parent took the sparrow to her home in the outskirts. The following morning the orphan and a strange sparrow got into a heated conversation on opposite sides of a screened window. After much talk, the sparrow on the outside disappeared for a while, returning finally with a worm, which it tried to deliver to the baby inside.

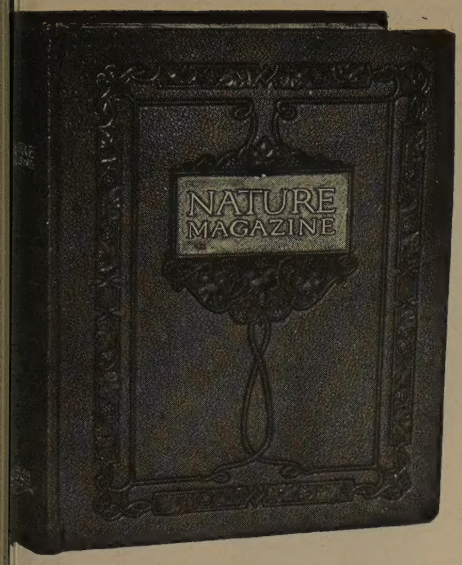
So I want to apologize to all sparrows for the mean things I have said about them. I will do it no more. Mrs. Sparrow is no glamor bird, has no gorgeous gown and her song is awful, but she *will* go dig a worm for an orphan.

Johnsonia

The latest additions to the publication *Johnsonia,* brought out by the Department of Mollusks of the Museum of Comparative Zoology, Harvard University, treat of the genera *Modulus, Columbarium, Casmaria, Galeodea, Phalium* and *Cassis* in the western Atlantic. R. Tucker Abbott discusses the first named of these genera, and William J. Clench the others. These publications add three numbers and twenty-eight pages to the shell material thus far made available through *Johnsonia.*

Against Grazing

At its annual meeting on October 27 the New York City Federation of Women's Clubs, on motion of Mrs. Charles Cyrus Marshall, chairman of conservation, went unanimously on record against any step that would extend grazing privileges in National Parks. The resolution pointed out that the contribution of such grazing would be of negligible importance with relation to our domestic meat supply, and that the damage to the National Park areas would be great if not irreparable.



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Creatures of Habit

At her home, Shadyside Park, Anderson, Indiana, Mary Larkin Cook plays host to many birds, collecting interesting information about their habits. Recently she had some commentary on eyesight and habit among birds. Two brown creepers were zigzaging up two small trees about three feet apart. On one tree suet was fastened. One bird passed close to the suet without even seeing it. One day the suet was moved from its regular spot to a place about a foot away. A downy woodpecker that had been used to coming to it returned to the spot where the suet had been. He chirped and scolded and returned every day for a week to the old spot before he discovered the new location nearby. Another downy visitor was crippled, one broken leg sticking out at an angle. Yet he came daily for suet for two years, bracing himself with his tail and getting up the tree with one leg.

ONE BRIGHT DAY

By ROBERT E. BALL

Brilliant blue, the pure October sky was a perfect background for the array of colors of the more distant trees and shrubs on the afternoon of October 22, 1944. A warm sun felt welcome as I dug the carrots in our garden, looking up now and then for discovery of some new fall wonder. It was very quiet.

The sound of swirling leaves suddenly took my attention. There had been no wind; there was none yet where I was about forty feet from several wild cherries whose yellow leaves scarcely clothed the trees. But those trees were in real motion—a whirlwind set the leaves quivering first and then soaring into the sky. The wind slowly reached the ground level to pick up leaves already fallen, as well as a few pieces of corn stalk, and send them flying swiftly into the air. The movement away from the trees seemed very slow, but finally the wind reached me and upset the half bushel basket in which only a few carrots had yet been placed.

By this time the winged leaves had become tiny sparkling jewels in the cloudless sky. They each reflected the sun as they swirled far above and beyond me, so high that their identity as leaves was lost. They reminded one of paper just released from an airplane. The force of the wind was already gone; nothing more was being picked up. Slowly the leaves settled to the earth, their golden hue contrasting with the blue of the sky as they became lower. They settled over a wide area of adjoining fields.

Long before the last leaves reached the ground the air was as still as it had been before I heard the rustle in the wild cherries. It had been a very miniature tornado, unlike anything else I had ever witnessed, making another fascinating chapter in the story Nature unfolds to the interested observer.

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Under the Microscope

By JULIAN D. CORRINGTON

TEETH

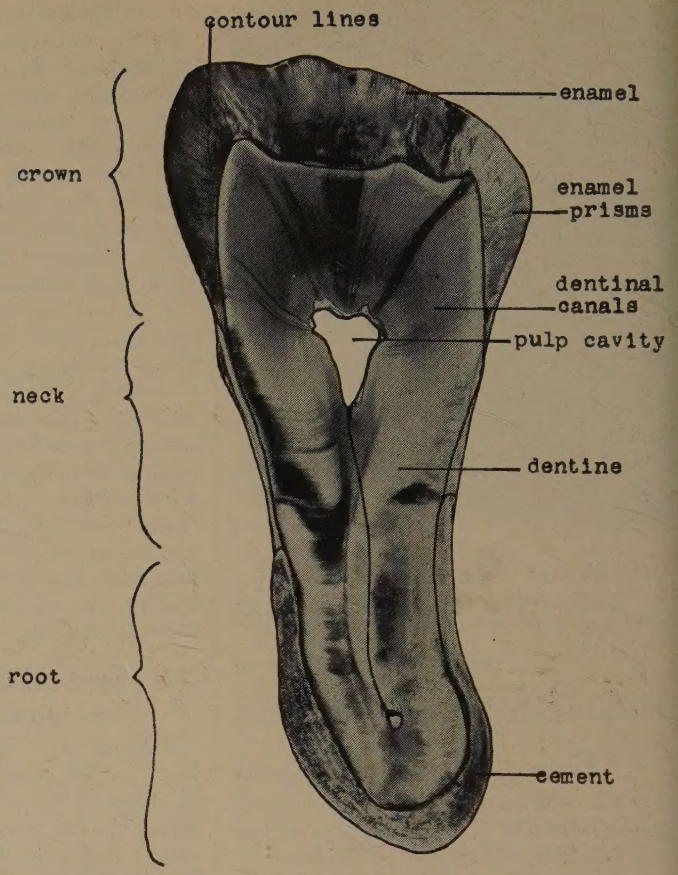
A GENTLEMAN of Chinese persuasion was phoning a dentist for an appointment on the following Monday. "Two-thirty?" queried the dentist. "Yeh," answered the Chinese, "yeh, tooth hurty, but what time me come?"

We can all sympathize with the suffering Celestial, for tooth-hurty falls to the lot of nearly every one of us. Whence came these useful but pestiferous chisels and grinders, and how are they built so as to be very much alive and yet so hard? The owner of a microscope has an advantage over his fellows; he can pursue his own inquiries along these and related lines.

Many objects in the animal world are designated as "teeth" purely by analogy, and have no right to the name. Thus, the so-called "teeth" of mollusks are merely projections along the hinge line of one shell that fit into corresponding depressions in the other, serving to lock the two shells, when closed, in a way to prevent side-slipping. By extension we meet with this term in plants or inanimate subjects, as the teeth of the peristome of a moss, teeth of a cogwheel, rake, or comb. Even a gale of wind has teeth in it according to literary usage!

True teeth are found in vertebrates only, and, strangely enough, did not arise as such in primitive and ancient species. Comparative anatomy shows clearly that the minute placoid scales of sharks gave rise not only to higher forms of scales, but to teeth as well. The placoid and tooth are alike in structure and development. Where these scales passed across the rims of the mouth they became enlarged; since they were already sharply-pointed cones of bone and enamel and projected toward the rear, they needed only increase in size to serve admirably in seizing and holding struggling prey. This is the function of teeth in all groups of vertebrates below mammals; only mammals chew the food and begin digestion in this process of mastication; other vertebrates bolt the food whole, or, at best, cut it into large pieces that are swallowed without chewing.

In lower vertebrates teeth occur on any of several cartilages or bones that are met with in the mouth or throat region, but in mammals are confined to the two jaws. In lower groups



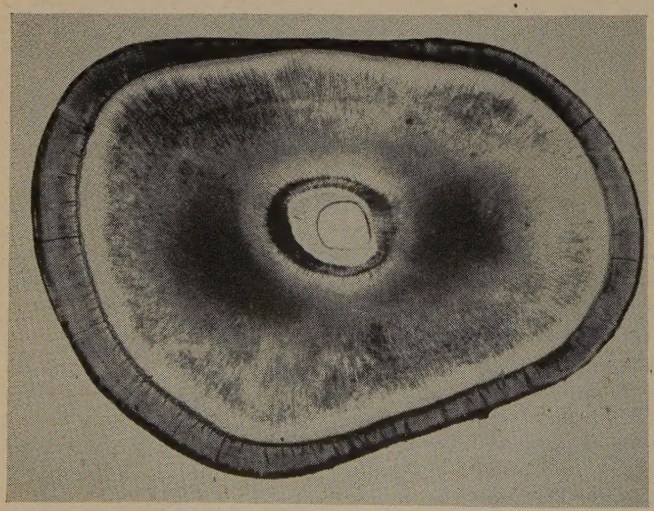
Longisection of human molar, dry ground, 7.5X. All slides courtesy of Ward's Natural Science Establishment.

teeth are generally all alike (homodont), are not set in sockets, and have an endless succession, new ones forming to replace any that are lost. In mammals the teeth are of diverse kinds (heterodont), lie in alveoli or sockets in the jaw bones, and usually consist of two sets, the milk set and the permanent dentition.

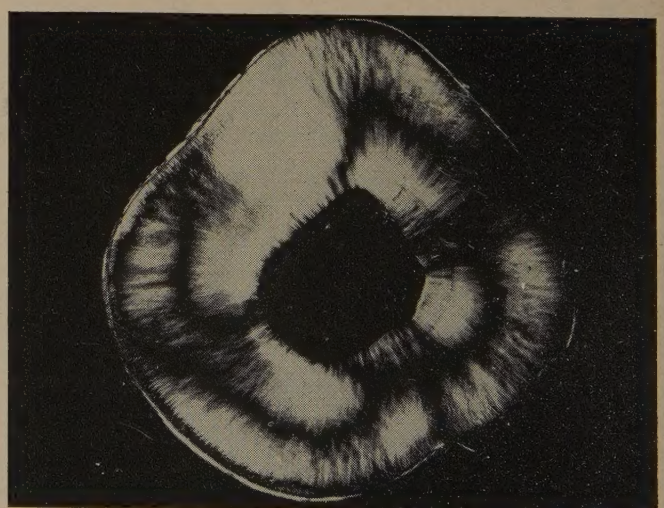
In man, the permanent dental formula reads:

$$I\frac{2}{2}, C\frac{1}{1}, P\frac{2}{2}, M\frac{3}{3} \times 2 = 32.$$

Numbers in the numerator refer to teeth in one-half of the upper jaw, those in the denominator, one-half of the lower jaw, the formula in man being completely symmetrical, which is not



Cross section, human premolar, ordinary light, 21X.



Cross section of human molar, polarized light, 10X.

e case in all species. Letters designate e kinds of teeth: incisors, canines, pre-olars (called bicuspids by the dentist), nd molars. Incisors are cutting teeth, kened to chisels; canines are conical nd, where well developed, as in carni-ores, are for stabbing, seizing, and tear-g. Premolars and molars are classed to-ether as molariform teeth and function grinders in most mammals, but have nife-like edges that shear past each ther in the act of chewing and so serve meat-cutters in the carnivora. Premo-rs occur in the milk set, but the true olars are found in the permanent set nly and represent a device to add more eth as the size of the mouth gape in-creases. Enlargement of individual teeth provided for by the development of e two sets.

No organ shows a more interesting or iverse history in vertebrate evolution. urtles and birds have long since lost eir teeth, the functions being taken ver by a horny beak. Venomous snakes ave grooved or hollow teeth, generally alled fangs, for conduction of venom nto the wounds they make. The elephant, arwhal, walrus, wild boar, and many ther mammals have specialized teeth at vary from slightly to enormously nlarged tusks, useful as digging tools nd as weapons. Rodents wear away their cisors by constant gnawing; hence these eth meet the situation by growing roughout life, compensating for sur-ace wear. The full story of these ivory ructures could fill a volume.

The parts of a tooth are: the crown, rojecting above the gum and capped ith enamel; the neck, covered by the um; and the root or roots, lying within lveoli of the jaw bone, and covered ith cement. The enamel leaves off and ement begins at the neck; sometimes he enamel overlaps the cement for a hort distance.

Teeth are among the hardest objects of he entire body and so resist decay to the ast. Accordingly they are among the ommonest of fossilized remains and it s fortunate that they tell so much of the lassification, size, and habits of their ormer owner. A famous statement at-ributed to Cuvier, founder of compara-ive anatomy, declared that from a single ooth he could reconstruct the entire ani-nal. One can see the point by reflecting hat gnawing incisors are not found in arnivorous species and that crushing nolars are needed only by those that ave to grind up such resistant plant naterials as stems, leaves, or seeds. Mam-nalian taxonomy leans heavily upon eeth for both living and fossil species.

A tooth begins its development when a hickened pad of the epithelium lining he mouth (oral epithelium) sends a projecting ridge down (lower jaw) or up (upper jaw) into the surrounding mes-enchyme or embryonic connective tissue. This ridge, the dental lamina, produces a series of inverted cups, the enamel organs, one for each future tooth. That part of the mesenchyme lying within one of these cups becomes the pulp of the tooth, and produces the major portion of the hard tooth itself, the dentine, a form of bone. The enamel organ manufactures the enamel, hardest substance in the body; the mesenchyme outside the enamel organ contributes the cement. Growth continues until the time is ripe for the tooth to erupt through the gum and take its place as a functioning organ.

Thus a tooth is a dual organ: the enamel is ectodermal in origin and belongs with the skin, just as much so as hair or sweat glands; the dentine and cement are forms of bone and should hence comprise a part of the mesodermal skeleton. Functionally the teeth serve as organs of food prehension and mastication and must therefore be classed with the digestive system. What are they then —parts of the integumental, skeletal, or digestive system? You can take your pick, or say all three, and no one can gainsay you; it is all in the point of view.

Referring now to the photomicrographs accompanying this account, the enamel is seen to have two sets of fine lines that cross more or less at a right angle. Those that follow the outer margin, curving so as to remain parallel with it, are contour lines and represent the extent of growth of the enamel at successive stages; recently it has been stated that each line corresponds to a resting stage, during sleep, and that the total number of lines indicates the number of days necessary for the given tooth to develop. The case is like that of the annual rings seen in the cross section of a tree trunk. The other lines are radial and mark out the enamel prisms, building units of this substance.

In the thick layer of dentine, the most noticeable feature is the immense number of dentinal canals, running radially from pulp cavity to enamel. These correspond to the canaliculi of bone and, in life, house exceedingly fine protoplasmic processes from the layer of living cells, the odontoblasts, lining the inner face of the dentine. These processes are the dentinal or Tome's fibers, and not only have to do with formation of the dentine but probably also convey stimuli to nerve cells in the pulp, thus accounting for the extreme sensitivity that makes a trip to the dentist anything but pleasurable. The pulp is a soft tissue, richly supplied with blood vessels and nerves, which enter through a small opening at the tip of each root.

We began our story with a sample from the huge store of humor connected with the subject, and cannot be repressed from closing in the same manner. Teeth differ from all other organs in one final respect: no one can select his own eyes, or mouth, or nose—but any man can pick his teeth!

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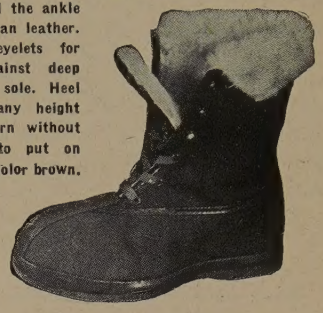

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ADVANCED HINTS

Preparation of teeth for microscopical study: As with bone, two methods are in general use: decalcification and sectioning, or grinding dry. The former removes mineral matter and preserves the organic; the latter does just the reverse and is in general the more useful of the two.

For a section of decalcified tooth, remove the lower jaw from a freshly-killed laboratory animal, as rat or cat, and with as fine a saw as possible, cut through the jaw on each side of the canine, removing a piece of the jawbone containing the entire canine. Fix in Zenker's or Bouin's for approximately 36 hours, then wash thoroughly in water (after Zenker's) or 70% alcohol (after Bouin's). Following the water wash after Zenker's, place in 70% alcohol for 24 hours. Next, from either fixer, transfer to nitric acid decalcifier, which extracts the mineral salts from the tooth. Strong nitric acid, 10 cc., 70% alcohol, 90 cc. Use 50 times the volume of decalcifying solution as compared with the object, shake occasionally to insure uniform penetration, and change daily until the tooth is well decalcified, usually from 5 to 6 days. One of the best tests is to try to run a needle into the tooth; the process is complete when the needle penetrates readily. Inasmuch as such treatment ruins the tooth at the puncture, it is well to carry two teeth through these steps, using one for the testing and discarding it later.

Wash out the acid by repeated treatment with 70% alcohol, then process for sectioning. The freezing method is best, and if the apparatus is available, run the tissue down to water, wash in running water for 24 hours, and proceed as usual. Next best is the celloidin method, and least desirable is the paraffin technique. However, if the latter alone is possible with the apparatus at hand, dehydrate quickly to avoid excessive hardening; 83% alcohol, 15 minutes; 95% alcohol, 15 minutes; absolute alcohol, 1 hour; cedarwood oil until clear (1 to 2 hours); xylene, 2 minutes; a very soft paraffin (e.g., 45°mp), 1 hour; 50° paraffin, 4 hours; imbed in fresh 50° paraffin and section. A heavy knife works much better than a safety-razor blade in a holder. Use any contrasting combination of stains, as hematoxylin and eosin, alum cochineal and Lyons blue, or Van Gieson's.

In preparing dry ground sections of bone or tooth, use a completely dry specimen, as from part of a skeleton. Make two cuts with a fine saw, as close together as possible, either transverse or longitudinal, as desired, or both, using two specimens. Grind the object down on an abrasive wheel, first from one side then the other, until very thin, then finish by placing it between two fine hones and continue the grinding until the bone or tooth is so thin that fine print can be read through it. Naturally, the specimen must now be handled with extreme care, owing to its fragility.

Wash well in water, then pass into absolute alcohol for 15 minutes, then ether for 30 minutes. This treatment gets rid of all bone dust, grease, and any other foreign material or detritus. Transfer the section to a slide, cap it with another slide and tie the two together with string, rubber bands, or other clamps, allowing to dry thoroughly without warping. Mount in thick balsam and weight the cover glass until the mountant is completely dry and hard, which may take from 2 to 4 weeks. Two favorite methods are: place a small lump of solid balsam on a very clean slide and warm gently until it melts; or place a drop of thick xylene-balsam on a slide and warm to drive off the xylene. Thick balsam is used because it cannot enter the fine canaliculi. Air is trapped in cavities and appears black against the white matrix of bone or tooth, providing sharp contrast.

WILLIAM BAUSCH, 1861-1944

On October 19, William Bausch, chairman of the board of the Bausch & Lomb Optical Company, and last surviving son of John Jacob Bausch, founder of the firm, died at his summer home near Rochester, New York. Age 83 at the time of his death, "Uncle Billy," as he was known to hundreds of employees, survived by less than three months the passing of his elder brother, Edward, as reported in these columns in the November issue. The dean in age and years of service of the Early Settlers Club of Bausch & Lomb, William Bausch had been with the company more than 69 years, and was widely renowned for his many patents and especially his development of optical glass, which grew out of experiments begun in 1903. He was responsible for the founding of the optical glass plant at the factory in 1915, the first of its kind in America, saving the industry in this country when this type of glass became unavailable from European sources during the first world war.

Turning out some 425,000 pounds of optical glass during this first world conflict, the plant has been enlarged with new furnaces and buildings since Pearl Harbor and has produced more than four million pounds of this critical war material to meet the needs of the United States and her Allies in range finders and many other strategic instruments.

Widely known for his affable, informal manner that won him a large circle of friends, Mr. Bausch always manifested great interest in civic affairs. Together with George Eastman and Henry Lomb he took part in establishing dental clinics. He was founder and served as president of the Rochester Club for 32 consecutive years and for more than a quarter of a century was chairman of the Annual Orphan Day outing and a trustee of St. John's Home for the Aged. The Community Chest, Red Cross, Optical Society of America, Rochester Historical Society, Museum Council, and many other organizations and clubs will miss an influential member of long standing. A fuller account of William Bausch, with a portrait, will be found in this Department for June-July, 1939.

TRADE NOTES

The publication *Bios* has adopted the praiseworthy policy of issuing pamphlets as a *Bios Classroom Series*, and if future issues can be judged by the first number, these booklets are going to be of decided service to teacher and student alike. Number 1 is "Introduction to Biological Latin and Greek," by Professor P. H. Yancey, S.J., Spring Hill College, Spring Hill, Alabama. For each of the two languages of word source in scientific nomenclature the author gives the alphabet, pronunciation, declensions, and for Latin the agreement and comparison of adjectives. This introduction is followed by a condensed dictionary of combining forms, with examples of usage. This eleven-page, inexpensive paper will prove more attractive, we believe, in the majority of cases than the more complete and accordingly more costly books. Price, ten cents. Order from Bios, Mount Vernon, Iowa.

The more recent issues of *Turtox News*, publication of the General Biological Supply House, Inc., 761-763 East 69th Place, Chicago, 37, Ill., have carried many articles of interest to the microscopist, especially those on microscopy proper by A. C. Lonert. In the August issue, Vol. 22, No. 8, he writes on "Stereoscopic Vision the Monobjective Binocular Microscope," in the September issue "Microscope A, B, C's," which discusses magnification, resolution, equivalent focus, curvature of field, and definition, while in the October number the same author has the leading article, "Microscopy Illustrated," supplementing the preceding and including 25 excellent illustrations on numerical aperture and light as affecting resolution, on spherical aberration, the star test, and glare.

Other articles in the August issue deal with paramecium, microprojection, development of bone, and the feeding of hydra; in the September issue the leading article is by Dr. H. M. Smith, head of the microslide department of General Biological, on "The Development of Teeth," with 14 excellent illustrations, especially pertinent to our own subject this month, and a splendid article on plant epidermal hairs, with camera lucida sketches, by Patricia B. Mueller.